NEWS IN PERSPECTIVE

MANAGEMENT VIEW

INDUSTRY CONSTRUCTION OUTLAY for 1960 will probably fall short of budgeted total by several percentage points, a continuing recheck of budget data first compiled by EL&P a year ago shows. But, utility expansion has moved at a faster pace in the latter half of the year, with more than a hundred of the largest companies spending at a rate of some $259-million a month, compared with about $204-million monthly in the first half of 1960.

WHAT'S THE OUTLOOK FOR '61?--Out West it's most optimistic, as far as electric utility expansion plans go. These utilities are already on record for heavier-than-ever spending for new facilities: Pacific Gas & Electric plans investment of more than $500-million through the end of '61 (and Pres. Sutherland says, "The pace of keeping ahead of the continued booming growth has quickened . . ."): Arizona P. S. will spend more money than in any year before (including $34-million for gas and electric facilities in first six months) . . . and "APS' expansion will continue at this steady pace through '65," says Chairman Jacobs; New Mexico P. S. Co. will increase by $1-million the $13-million level of 1960 expenditures; and So. California Edison estimates its 1960 expenditures at about $130-million.

BUT, MANUFACTURERS' BACKLOGS will probably continue to hold at a level below the volumes for heavy electric equipment ordered in the late '50s. As of now, the latest EEI Semi-Annual Electric Power Survey shows, scheduled production for heavy electric generating equipment for next year is less than the 1960 total. (Shipments of power transformers, expected to total about 51-million kva, compare with manufacturing capacity of some 80-million kva.)

ACTIVITY IN POLITICS was reported to be much greater among utility company employes in the recent campaigns, with a big share of credit going to the "applied citizenship activity" organized in many power companies. One of the first companies to undertake a program, Detroit Edison estimates that as much as 75-percent of the first 1000 of its employes to finish 8-10 week training courses have been active in local or state level politics.

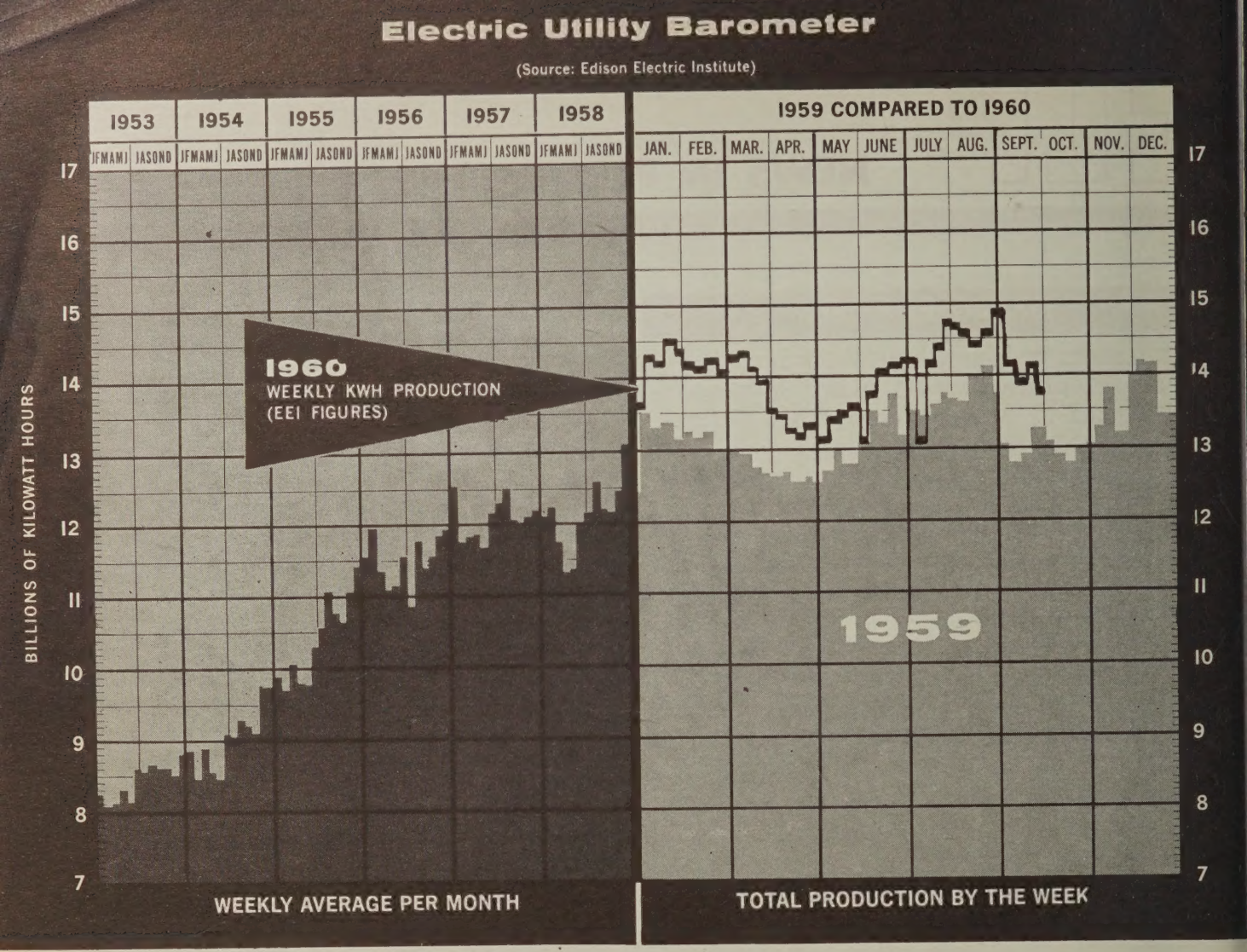
DRESDEN POWER COSTS will eventually be in the 7-1/2-mill range (excluding the research and development costs, which have been substantially written off), is the belief still held by Commonwealth Edison and expressed recently by the utility's V-P Gordon R. Corey in response to a query by a Wall Street investment house. But "good operating costs figures are not expected to become available until 1967," he indicated, saying that "now all I can do is talk in generalities."

OUTSIDE BUSINESS ACTIVITIES of key employes are condoned by about two-thirds of 195 companies recently polled by NICB; however, the practice is generally discouraged . . . and "conflict-of-interest" situations, especially involving purchasing department officials, are scrupulously avoided.

ECONOMIC CLIMATE

MILD SLOWDOWN, not recession or depression, seems the appropriate diagnosis for the current economic situation. And, realistically, it also appears that the next decisive move will be upward. A hiatus in inventory accumulation, while a tendency developed for stocks to be held at the manufacturing, rather than the retail or wholesale level, is in large part responsible.

MANUFACTURERS ARE OPTIMISTIC, more



NEWS IN PERSPECTIVE

so than in Fall of 1957 (at outset of '58 recession), an NICB survey of 173 companies discloses. Most of them expect first half of 1961 to bring them more business than the same period a year earlier.

TURNING POINT for industrial production is almost certain to come during the winter. Personal income--a key to consumer purchases--is keeping high. So are employment, pay rates, and the number of hours worked. The dip in industrial production, so far, is significantly bigger than the decline in total output of goods and services.

GOVERNMENT INFLUENCE on the economic picture is far more likely to be a stimulant than a depressant. The fiscal 1962 budget to be given to Congress before President Eisenhower leaves office obviously will be modified. Revamping of present programs could easily turn the modest surplus of $1.1-billion predicted by the Administration into a deficit.

WASHINGTON INFLUENCE

AMERICAN SHARE of U. S.-Canada development of Columbia River basin will total $142-million over the next ten years with 1,686,000 kw of prime power available in this country, including about 500,000-kw from Libby Dam which would become possible after approval of the treaty. Downstream power benefits in the U. S. from the three Canadian-built storage dams would be divided equally and recalculated every five years. Even with an additional $242-million to come out of U. S. pockets between 1970 and 1985, treaty negotiates claim that total initial annual costs of new prime power

will be less than half of Bonneville's present rates and added capacity will still be less than Bonneville's average rates.

The report presents the joint venture as a great bargain. It notes that to provide the U. S. with the same amount of flood control plus G&T that will come from Canada would cost about $710 million in the ten-year period when Canadian storage will become available. If the U. S. were to go ahead with the seven projects in the basin recommended by the Engineers--the equivalent of the three Canadian dams--it would mean a Congressional appropriation of $75 million each year for 9 years (the time of Canadian construction).

Of the U. S. power benefits, three-fourths will go to Columbia River Power System and the other one-fourth to projects under license to Chelan County PUD and Grant County PUD.

CONCERN over "crippling conditions" proposed by special interests in the San Luis reclamation development has been conveyed from the Department of Interior to California's governor. The conditions which would limit state permits sought by the Reclamation Bureau, Acting Secretary Bennett has warned, "are not compatible with the project plan of operation as authorized and contemplated by the Congress." Bennett stressed the importance of water rights and noted that Congress assumed "cooperation and good faith" on California's part.

1959 SUPPLEMENT to FPC's "Steam-Electric Plant Construction Cost and Annual Production Expenses" is available from the Superintendent of Documents, GPO, Washington 25, D. C., for $1.25 a copy. It contains data on 522 plants plus a discussion of trends in plant design, A-power installations, operating labor requirements and cost of power production as well as kinds, costs and utilization of efficiencies of power production fuel.

"RIGGED" BIDS have been deplored by the National Institute of Governmental Purchasing, which pledged that its members would try to combat this "social evil" by working closely with federal and state antitrust agencies. The government buyers complained of "the widespread and increasing prevalence of rigged bidding" for purchases to be made with public funds.

FOSSIL FUELS can meet the needs of the U. S. and the rest of the world for the rest of the century "with only moderate increases in real costs," according to a report of the Atomic Energy Commission. Beyond the year 2,000, the adequacy of fossil-fuel resources is less certain. Though huge reserves will exist, a compounding of demand at the same rate predicted for the rest of this century--4 percent per year--would exhaust them by mid-century.

TAX PROBLEMS sure to come up before Congress in 1961 have been outlined by Treasury General Counsel David A. Lindsay. Lobbying expenses, depreciation, income tax withholding on interest and dividend payments, and the dividends-received credit are among them. Odds are against any hurried changes. Most pressure is likely to come on removing the dividends-received credit. As Lindsay sees it, chances for reduction of the over-all tax burden are "not promising." He notes that there is not universal agreement that it would be possible to rewrite the tax law so that significant rate reductions might be made without loss of needed revenues. Note, however, that Rep. Wilbur Mills (D., Ark.), chairman of the tax-writing Ways and Means Committee thinks revision of the tax rate structure is "essential" to continued economic growth.

TVA EARNINGS for the first quarter of fiscal 1961 were $11.6-million, $2.5-million more than in the same period a year ago. Net income for the year ending September 30 was $53.5-million

or an increase of $6 million over the corresponding total a year earlier. Net power proceeds (on which debt service on TVA bonds will have first call) hit a record $102.9-million for the year--greater by $9.6-million than the total of a year earlier. Revenue from power sales for the quarter reached $57.2-million.

INDUSTRY SIFTINGS

NEZ PERCE-MT. SHEEP PROJECTS hearings of the FPC opened as scheduled early last month, although counsel for the Washington Public Power System sought a delay for the fourth time. (Opposing Pacific Northwest Power Co. charged the PUD group was again "stalling.") In opening testimony, Oregon's Gov. Hatfield backed the Mt. Sheep proposal. PUD's spokesman, Owen D. Hurd, declared: "Private utilities in Oregon were invited to indicate interest in buying Nez Perce power . . . but have expressed disinterested." (See page 32.)

APPARATUS PRICE CUTS have been made by both GE and Westinghouse recently. The latter dropped switchgear prices about 10-percent on a net price basis; GE reduced prices 3-percent on EEI-NEMA standard design network transformers, calling this a "bonus for increased acceptance by electric utilities."

NAT. ELECT. WEEK SYMBOL, already distributed by the Week's Committee, was abruptly withdrawn last month when Reddy Kilowatt, Inc., claimed it was confusely similar to the Reddy Kilowatt symbol. Reddy also experienced unhappiness over use by two advertising trade magazines of a reference to PG&E substituting "Reddy Service" for Reddy Kilowatt, calling this erroneous note "a misunderstanding."

IMPROVED AD COMPETITION is promised for 1961 Better Copy Contest according to PUAA's Contest Chairman W. L. Perdue of K. C. P. & L. Co. Classifications and rules have been changed to affect this, he reports. Deadline: Feb. 1, with the new rules to go out early this month.

REGULATORY MATTERS--Ruling that only actual taxes arising from the use of Sect. 167 are to be used, the Ohio Commission's recent decision in a Cincinnati G. & E. Co. rate increase application case cut the increase sought by 30-percent; the Georgia Commission, ruling on a petition of the Georgia Power Co., ordered that taxes arising from the use of liberalized depreciation be normalized for both accounting and rate-making purposes; and the Pennsylvania Commission announced that reduction in Pennsylvania Electric Co.'s plant fair value for rate-making purposes brings its rate of return down from 6.5- to 6-percent, with a $2.27-million cut in rates.

SOUTHWEST'S FIRST 230-KV LINE, part of a transmission system linking Utah and Colorado, will be built with a new appropriation of $2-million voted recently by the P. S. of New Mexico board of directors. The 70-mile long portion to be built in 1961 will extend from Albuquerque to Ambrosia Lake.

RESEARCH--NOT IN VAIN: This point was proved last month when NEMA held its annual meeting and heard four of the electrical industry's top research scientists, Drs. S. W. Herwald, Finn J. Larsen, Herbert Trotter, Jr., and Walter R. Hibbard, Jr. Many new products, processes and materials resulting from hundreds of millions of dollars poured into research in recent years are just now coming into the market place, the speakers demonstrated.

MOLTEN SALT REACTOR experiment (MSRE) is being constructed at the Oak Ridge National Laboratory, to demonstrate the feasibility of this advanced concept for civilian power purposes. Promised for this type are these potential economic advantages: excellent steam conditions and higher efficiency through operation at very high temperatures and specific power.

FIRST SPACE KITCHEN for U. S. astronauts will be designed by Whirlpool Corp. to contain a miniaturized refrigerator and freezer and occupy an area less than 10-ft. long and 7-1/2-ft. in diameter in the capsule of a multi-stage rocket.

Future of Warning System,

"NEAR," May Be In Utility Hands

If the people of the U. S. are concerned enough about "survival" and the extent to which the enemy threatens it . . . if they would pay the price for an adequate place to hide when attack comes . . . the chances that the nation's attack warning system may finally be completed are now better than ever.

That vital point was reached when OCDM recently demonstrated successfully that its National Emergency Alarm Repeater (NEAR) System is technically sound, reliable and economically feasible. When the national agency conducted first public tests of the NEAR system (see box insert) on Oct. 11, from a control point at Charlotte, Mich., on the Consumers Power Co. system, more than 50 representatives of electric power systems throughout the nation were represented.

James H. Campbell, president of Consumers Power Co., addresses "NEAR" demonstration briefing conference, sharing platform with OCDM's Wendell H. DuPlantis and the Michigan-based agency's Director Leo A. Hoegh in recent public unveiling of warning system.

Electric utility interest, largely confined to a necessary technical curiosity at this stage of NEAR's development, should now extend to other aspects of the problem as the

(Continued on page 28)

EEI Market Research Group "Brainstorms" '60-'61 Aims

Ideas . . . ideas . . . 110 of them, all pertaining to possible and needed analyses in the field of electric utility marketing, were generated by the EEI Market Research Committee at its initial meeting in Detroit in September. The Committee, under the chairmanship of Detroit Edison's G. L. Lahodny, will approach the results of its "brainstorming" session again in a meeting at EEI in NYC on December 5.

The Committee reported following its recent meeting that, after "freewheeling" and "hitchhiking" themselves into this rather substantial quantity of unjudged ideation, results of their "brainstorming" efforts were then modified, clarified, classified, expanded and evaluated into the following practical objectives for the coming year:

1. Assemble, interpret and distribute information to assist member companies in the evaluation of sales results in terms of direct and indirect sales expenses incurred to accomplish such results.

2. In liaison with Electric Heating Committees, assemble available studies suggesting ways and means to achieve successful electric heat promotion. Emphasis will be on sales rather than load characteristic or engineering phases.

3. Assemble existing studies on corporate image and related areas, particularly insofar as they measure public opinion regarding quality of service and price consciousness, electricity versus competitive forms of energy.

4. Explore feasibility of cooperative market research efforts with the NEMA Market Research activity and other such agencies.

5. Determine what various companies are doing to obtain cooperation of architects and consulting engineers regarding installation of electric heating equipment in the new construction field.

6. Support the Annual American Marketing Association Public Utilities Marketing Seminar in 1961.

The evaluation subcommittee concluded that measurement of the effectiveness of national programs such as LBE and Medallion Home is necessary and that it should be performed by an independent agency. A proposal to this effect was submitted by Mr. Lahodny to the EEI sales division executive committee on October 18.

Federal Administration moves to apply NEAR as a key national defense measure. This is the next step in OCDM plans, with the agency counting on effective extrapolation of the pioneering cooperation of Consumer's Power Co. to make the warning system a fact of our defense posture on a national scale.

Consumer's part in the development to date has been considerable (including much of the cost of equipment installation and operation, "borne directly by Consumers in the interest of the people of the United States"). But, unquestionably the most significant contribution is this management viewpoint, expressed at the recent demonstration by the Michigan utility's Pres. James H. Campbell:

"This is a very wonderful vehicle to bring to people of this country a very real contribution. Only through the medium of electric power companies can this system be made to work."

OCDM's Asst. Director Lewis E. Berry answered the key question, "What's next?", in the open discussion following the test demonstration . . . and indicated the expected role of the private power industry. ("We will be on the lines of the power companies largely through largess . . .").

Mr. Berry referred to the just-completed demonstration as "one step—there are a half dozen others . . . and a number of policy questions remain." As to financing and implementing the establishment of a nationwide warning facility (at an estimated cost of $40-$50-million or "an average cost for all kinds of power systems of less than one dollar per household"), the OCDM official noted that one possibility is that the government would install the non-linear devices for creating large quantities of harmonic power over the nation's electric power networks. The power companies might maintain such equipment, Mr. Berry speculated, or, the system could be set up through some combination of government-private industry cooperation.

"Now that the NEAR system has been proved feasible," commented Mr. Berry, "we feel this project should not be held back." He spoke of a desirable completion target of "two to three years, rather than five to ten years."

The OCDM spokesman indicated that the NEAR system would be offered to the public as a "voluntary, not a compulsory program," on the premise that "the people will want to be warned." He noted that it will be some time before receivers will be on the market, and that the government hopes that the device adopted will be a "fairly inexpensive one, so that the public will decide they can't do without it." (A spokesman for GM's A-C Sparkplug Div., which has developed the experimental receivers to date, said the cost per unit is likely to be closer to $15 than the $5-$10 for which OCDM was hoping.)

In post-demonstration questioning, utility representatives were especially concerned with legal aspects, but this was acknowledged by Mr. Berry to be "the government's responsibility." And, Consumer's V-P Harry Wall commented: "Power companies will need to be held free of responsibility for alarm consequences."

The "heart" of the NEAR system is the signal inductor, manufactured by General Electric. According to GE, this device resembles a substation transformer, but acts, under intricate electric circuitry, to coax a special harmonic current (240-cycle) from a standard 60-cycle power system, tripping the home receiver alarm devices to warn of impending disaster.

The first three-unit bank of inductors installed at the Consumer's Battle Creek, Mich., substation provide an adequate warning signal for some 250,000 people. With the installation of a second inductor in Grand Rapids, Mich., would supplement the signal provided by the Battle Creek inductor, the prime coverage area is expected to be extended to include over one million people, or the entire Consumer's system.

Operating experience has shown that the NEAR system is compatible with the power system without any modifications other than the generator installation.

Utility men at the Charlotte, Mich., tests were particularly interested in the possibilities for transmitting coding signals for special alarm or control functions via the principle of the NEAR system. Through control of deferrable loads, the system could be of considerable value not only in emergencies, but for peak shaving.

The Sangamo Elect. Co. which has been conducting cooperative development with the Compagnie des Compteurs, demonstrated a low-frequency coded receiver and reported that such coded receivers are used extensively by utilities in France, Australia, New Zealand and other foreign countries. According to Sangamo, "future application of coded receivers in this country for power capacitor switching street light and water control

(Continued on page 82)

How "NEAR" Works—

OCDM describes its National Emergency Alarm Repeater (NEAR) System in these simplified terms for public instruction:

"The NEAR system is a reliable indoor warning system. A small portion of the regular 60-cycle current carried by commercial powerlines is converted to a 240-cycle signal. (This type of signal could be transmitted over long distances by equipment requiring only routine maintenance. And the signal system would not endanger continuity of regular power service.)

"By making use of existing electric power systems, which serve more than 95 percent of the buildings in the United States, and by a relatively simple method of interconnecting individual power networks, the NEAR system could send an alarm throughout the Nation within ONE MINUTE. This presupposes, of course, installation of NEAR signal generators at strategic points, and general distribution of the NEAR receiver. But the potential is there—the Nation alerted within ONE MINUTE.

"The alert in a natural disaster or an enemy attack would come from the NEAR receiver in the form of a loud buzzing sound lasting for 50 seconds. The alarm could mean: TURN ON YOUR RADIO FOR INFORMATION. If your local radio station is not on the air, tune to a CONELRAD frequency (640 or 1240 on the dial) for emergency information."

Experimental "NEAR" signal inductor installation, part of Consumers Power Co. substation at Battle Creek, Mich., is background for conference between (l. to r.): Harry R. Wall, Consumers vice-president for electric operations; Geo. T. Brownell, OCDM project engineer; and Consumers system operations supt., A. F. Gramm. Inductors for the OCDM warning system were designed by General Electric.

The "NEAR" system receiver (developed by GM's A-C Sparkplug Div.) plugs into standard wall outlet, uses about two watts of standby power. When activated by the inductor signal carried through a power system, it emits a loud, distinctive buzzing. General Electric also demonstrated a combination "NEAR" receiver and conventional table model radio, which could automatically tune to CONELRAD and a warning message.

Canadians Report: USSR Aim—Capacity Growth

A report of the visit earlier this year of Canadian electric utility representatives to power installations and industrial centers in the U. S. S. R. reveals a reaction very similar to that of the delegations of U. S. electrical industry representatives in 1958 and '59.

Here, in summary is the essence of the Canadian delegation's report:

"We were impressed by the magnitude, intensity and depth of the Russian power program which exhibits, as does the whole Soviet economy, a high rate of growth with heavy emphasis on industrial rather than domestic needs. We were also convinced of the value of further exchange visits between our two countries. The more we can encourage two-way visits of men and women of all walks of life between our two countries, the greater our contribution will be towards the breaking down of distrust, misinformation and misunderstanding which exists between us.

"The objective of the Russian power program is maximum increase of capacity per year and per unit of effort as opposed to maximum increase of energy production per unit of effort. Whether this objective is consistent with the stated national objective of maximum rate of improvement in the national economy is open to debate. There is reason to infer that another national objective—maximum "strength" as soon as possible—is the primary aim. If so, the objective of the power program is entirely consistent with the last.

"The power program objective leads to great emphasis on plants and units of large capacity resulting in demands for engineering development and manufacturing not present in other countries. The Russian scientists and engineers are meeting these demands with ingenuity and development effort and engineering work in depth and by facing up to high risk engineering when necessary (e.g. the construction of large dams on soft soils and the reduction in use of materials). In many cases, tight schedules are forcing engineering and construction techniques in uneconomic directions. For example, the extensive application of precast concrete was not considered by some Russian engineers to be economic, but procurement and construction periods were shorter and it was expected that in the "long run" it would be economic. In spite of these differences in approach, there did not appear to be any major innovation that would be economically applicable in Canada.

"The rate of construction has also adversely affected the quality. This was evident mainly in the class of finish of concrete, tile and other materials which, in many cases, would be quite unacceptable in most countries. However, there was no evidence of adverse effect of poor quality on the power producing components, although this might not be expected to become evident until several years of operation have passed. The poor quality of finish will undoubtedly have some adverse effect on operation and maintenance costs but, within the ground rules, this is not important.

"In general, the Russian engineers were proud of their accomplishments in engineering and construction in the power program—and they have reason to be. They are striving to achieve goals. Whether these will be fully met is anyone's guess."

Arizona Commission Rules On Determination Of Fair Value, Automatic Adjustment Clauses

In a ruling of considerable interest to all utilities, the Arizona Corporation Commission allowed increased rates to the gas department of the Arizona Public Service Company. The three important items ruled on were the treatment of Account 100.5, or plant acquisition adjustments, the determination of a fair value rate base, and the use of automatic adjustment clauses.

The Treatment of Account 100.5

The company had argued and the staff of the Commission had denied that any amounts of plant acquisition adjustment are properly includable in the rate base. While the amount in controversy was only $9000, the company considered that an important matter of principle was involved on which the Commission should rule.

The Commission's order stated in part that it was the contention of the applicant—

" . . . that in any net book study there should be included all amounts actually paid by the Applicant and approved by this Commission for gas properties in service, less the amortization applicable thereto. It was apparent that, by definition, the amounts collected in Account 100.5 were such and did not include 'write-ups,' 'reappraisals' or 'revaluations' whatever. The definitions for the accounts made it clear that items in the latter categories were included in Account 107. And, as respects these items the Applicant agreed the same were not appropriate to a net book study, and, as further respects which, no balance existed in any case."

Noting that the Company had substantial legal support for its position the Commission stated that—

" . . . if the acquisition concerned was accomplished by true arms-length bargaining as the result of which a prudent investment was made, such total price should be allowed in rate base and subject to reasonable amortization. This in spite of the fact that such price may exceed the 'Original cost.' "

The Commission concluded its observations with respect to the treatment of Account 100.5 by noting that—

"Historically, this Commission's Staff has not permitted the inclusion of Account 100.5 in rate base. As the smallness of the amount thereof involved in this case makes the problem here one of theory only, at this time the Commission will not direct its Staff to depart from its past position. Nevertheless, the Commission must state that in a proper case, where the amount involved is substantial rather than theoretical and where the then applicant company bears the burden of proving both that the purchase was prudent and arms-length, this Commission will be compelled seriously to reconsider the validity of its Staff's historic stand in this regard."

It is clear that by any equitable standards the exclusion of amounts in Account 100.5 would constitute confiscation of property, and to that extent it is hoped that the Commission will in the future affirm the Company's position in this matter. In addition, if such amounts are to be amortized, then such a "write off" should be part of the cost of service to the customers.

Determination of Rate Base

With respect to the determination of the fair value rate base which is required under the Arizona statutes, the Company contended that a weighting of only 50-percent of the current cost of the property is insufficient, and that the Commission should consider a weighting of 75-percent as being a more eralistic appraisal of the value of the plant. This, the Company noted, would fix the rate base of the Gas Department at approximately $48,317,000. The Company pointed out that the Supreme Court of Arizona in the Arizona Water Company case had ruled that the finding of fair value must be as near to the date of inquiry as possible, and that to that extent current cost must have a major weighting in the determination of present fair value. The Commission order noted in part that the Company further argued that—

"The Supreme Court in *Sims v. Round Valley Light & Power Co.* (1956), 80 Ariz. 145, 204 P. 2d 378,383, acknowledged that it is the changing valuation of the dollar which makes an R.C.L.D. study necessary. This for the reason that the utility is entitled to a reasonable return on *present fair value of its assets* which, in the event of inflation, may be different than such a return *on old dollars used to construct them.*"

Further in its report the Company pointed out that in the recent Fort Dodge case the Iowa Supreme Court gave a weighting of 70-percent to current cost, also involving a gas utility. The Commission's reply to this contention was that—

"Although the Commission finds these arguments impressive, nonetheless, the Commission realizes that, basically, rate base findings are and must be the result of the Commission's judgment and discretion after weighing all relevant factors, *Arizona Corporation Commission vs. Arizona Water Company* (1959), 85 Ariz. 198, 335 P. 2d 412. This Commission believes that, while a 'forward-look' may sometimes be in order, too generous engagement in future forecasting invites a possibility of error. In addition, it now appears that the past inflationary pace may be somewhat

slowed, at least for the immediate future. And, finally, should events occur in the future as predicted by the applicant, the Commission at that time, upon application, can again consider the problem. In the meanwhile, the Commission prefers to resolve all doubts in favor of the customer-ratepayer. It, therefore, must reject the applicant's proposal that a 75-percent weighting be given the R.C.L.D. study."

The Commission determined the fair value of the rate base to be $44,200,000, or 23-percent over the net original cost rate base, and some 8.5-percent less than that requested by the Company. As to the Commission's statement that the inflationary trend has decreased, there is certainly no indication of that in the continuing increases in the cost of living since the Commission began hearings in this case.

Automatic Adjustment Clauses

The Company asked for three automatic adjustment clauses. The Order noted that—

"The Applicant has had adjustment clauses for changes in excise tax rates, boiler fuel costs and the cost of gas purchased for resale. In its application, however, the Applicant asked for additional adjustment clauses for:

(1) Any changes in the wage rates or classifications of assigned operating labor from that used after June 30, 1959.
(2) Any changes in the tax rate or method of computation for Federal income tax or State income tax from that used in the return filed by the Applicant for the calendar year 1958.
(3) Any changes in the tax rate or method of computation for ad valorem tax from that in effect for the Applicant during the calendar year of 1959, or for the possible future imposition of any new taxes."

While the Commission granted the automatic adjustment clauses under (2) and (3) above, subject to a ruling by the State Supreme Court that such clauses were legal and within the power of the Commission to grant, the Commission denied the Labor adjustment clause on the grounds that such an automatic adjustment would make the company less diligent in resisting wage increases. It is believed that the automatic tax adjustment clauses are the first ever granted.

Market Potential?—Key To It Is "Selling Effort"

There is less built-in growth in the future of utility sales now than at any time since World War II, R. R. Cahal, Jr., Ebasco's marketing consultant, warned a group of nearly 100 marketing executives from 23 gas and electric utilities attending the recent 24th annual Ebasco Services Client Companies' 3-day Conference in New York.

The realizable potential is greater than ever before, however, said Mr. Cahal.

"This puts it squarely up to the factor of 'selling effort,'" he emphasized. "Both industries (gas and electric) are indicating a willingness and ability to meet this challenge. To the extent that they are competitive, the effectiveness of one will cut into the results of the other. No doubt points will be made on each side, but the potential provides enough room for both to grow," he observed.

Mr. Cahal expressed confidence that market knowledge will be greater, advertising and selling tools will be sharper, and that "increased promotional effectiveness will ensure the continuation of profitable growth of utilities through the coming decade."

But, other speakers raised some stiffer challenges. For example:

The utility industry can "stagnate" if it does not concentrate on "forward planning" in marketing, Stanley F. Damkroger, assistant vice-president of the American Telephone & Telegraph Co., said.

Major purposes of the conference: to discuss new and improved marketing concepts for the utility industry and to assist the companies in planning 1961 sales programs.

Mr. Damkroger urged the utility industry "to create demand, not just supply it." He told the executive group to expand their sales horizons, adding that "marketing complacency" was the greatest single detriment to a healthy organization.

Real growth must come from new concepts, new ideas and new products, Mr. Damkroger stated. "A company that relies for growth on population and personal income increases will soon lag far behind."

The telephone executive noted that the Bell System, despite huge post war increases in calls, phones, and capital investment, decided to change its marketing philosophy just five years ago. "We recognized that we were in the communications business and had to expand our thinking far beyond the 'phone' concept. The Bell System, for example, has now embarked on a project for the development of communication among machines," he noted.

George M Robertson of General Electric spoke to the Ebasco conference on "Motives In Industrial Buying:" Miss Willie Mae Rogers, Director of the Good Housekeeping Institute gave a talk on the "Power of Women;" and Roger H. Bolin, advertising director of the Westinghouse Electric Corporation discussed "The Test of Market Power."

Ebasco: Here's Sales Outlook

Here's how Ebasco sums up the near-future outlook for electric and gas utilities:

"The electric utility industry can look forward to mixed sales trends in 1961, but the outlook is basically good. Total electric utility sales are predicted to reach 713-billion kwh next year, an increase of 5.3-percent over 1960. This increase is less than the growth rate experience in 1960.

"Residential electric sales are forecast to increase 8.9-percent, about the same as in 1960; commercial sales are forecast to increase 8.0-percent, about the same as in 1960; and industrial sales are predicted to rise 2.5-percent, somewhat below the percentage increase in 1960.

"The gas utility industry can also expect a mixed year in 1961. Total gas utility sales are expected to reach 96.9-billion therms next year, or 4.2-percent above 1960 sales.

"Residential gas sales are forecast to be 6.7-percent higher in 1961 than they were in 1960; commercial sales 7.5-percent higher, and industrial sales 2.0-percent higher. The growth rates for residential and commercial are comparable to those experience in 1960. The industrial growth rate is down some from the previous year, due to the smaller expansion of the economy as a whole."

by RALPH ELLIOTT
Washington Editor

A Matter For The States

A problem currently faced by many REA-financed electric cooperatives—territorial conflict with neighboring power companies or municipal electric systems — will undoubtedly mushroom in the years ahead. A recent issue of the National Rural Electric Cooperative Association's weekly newsletter, MINUTEMAN, warned co-ops that "The extent and seriousness of the territorial problems facing rural electric systems becomes more alarming every day."

As these service area disputes have spread, so has the question: At what level will they be settled? Now the answer seems to be clear: At the state level.

In the first clear-cut territorial conflict case to reach the U. S. Supreme Court, a co-op has been denied a review of a decision by the Colorado Supreme Court. This leaves standing, as final, the state court's ruling that the co-op may not expand into an area which private utilities are serving or are willing and able to serve.

The case arose in 1955, when Union Rural Electric Association, Inc., applied to the Colorado PUC for a certificate to serve exclusively a suburban area north of Denver, which was part of the service area of Public Service Co. of Colorado and Colorado Central Power Co. Union also requested that it be given public utility status and territorial protection as a public utility. It had, only a month earlier, amended its by-laws so as to hold itself out to serve other than members.

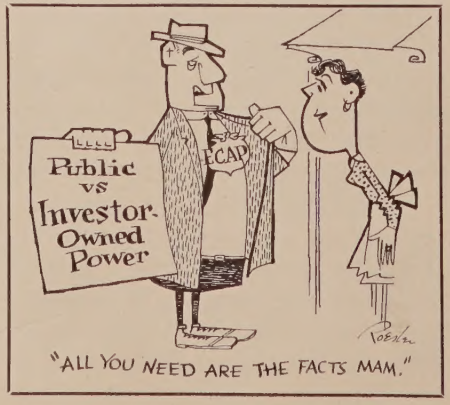
After lengthy hearings, the PUC decided on January 7, 1957 that the co-op had acquired public utility status, that it was entitled to future territorial protection, and that it had equal rights with Public Service and Colorado Central to service the area in question. The Commission issued Union a certificate, but refused to assign it an exclusive service territory. Both the co-op and the companies, the PUC held, would require certificates to extend service in the area.

In reversing the PUC ruling permitting Union to expand into the companies' service area, the Colorado Supreme Court held in a 4-2 decision that "Public Service and Central have for many years been ready, able and willing to render adequate regulated service to the residents of the area. There is a complete absence of proof that any additional service is required or desirable." The court affirmed the PUC's grant of a certificate to Union, but restricted the co-op to serving those customers it had as of the date of the PUC decision. It further held that no certificates were required by the companies to serve customers other than Union's.

The court went on to add these significant findings:

"Public Service and Central having served the area long prior to Union's incorporation have at great expense acquired valuable rights to serve the area, all in conformity with law and with the approval of PUC, and PUC cannot deprive them of their rights nor curtail or limit them in exercising their rights to extend and expand their services in the area so long as such expansion does not impair or endanger service to others or other areas entitled to their service.

". . . PUC has no authority to grant to Union any rights of extensions in the area except upon application and proof of the fact that adequate service is not readily available from Public Service or Central and that public convenience and necessity requires that Union render the service."



The two dissenting judges accused the majority of having set aside the PUC findings "upon the simple basis of lack of sympathy for the cooperative arising from its having evolved as a federally sponsored instrumentality."

In seeking a U. S. Supreme Court review of the case, the co-op attempted to inject the requisite federal question primarily by its contention that the state court "denied the petitioner (Union) the constitutionally required equal protection of the law by placing Union in a special category, by which Union is denied the territorial protection and growth potential accorded to other public utilities by statute."

Union further asserted that the decision adversely affects all other electric co-ops in Colorado; also, that used as a precedent it could possibly threaten co-ops throughout the country and impair their ability to repay their federal loans.

But the high court turned its back on the case. It wrote no decision, merely refusing to accept the case for review. In other words, from the petition filed by Union and the answer filed by the companies, it must have been apparent that the state court committed no error — either as to constitutional rights or interpretation of the REA Act — that required correction by the federal court of last resort.

The question of how these territorial conflicts should be resolved may soon be cropping up in state legislatures on a broad scale and in various interesting forms.

MORTGAGE PLEDGE ON DRESDEN, consented to be the AEC in granting to Commonwealth Edison the first full-power, full-term operating license for a power reactor, appeared to be necessary, according to AEC Hearing Examiner Jensch, for these reasons: (1) for the utility's continued normal financing arrangements, and (2) to encourage scientific and industrial progress and "widespread participation in the development and utilization of atomic energy for peaceful purposes." He said that the Commission's lien concession is subject to conditions which will protect the public safety and the common defense and security, "by assuring Commission control over any transfer of the licensed facility pursuant to the mortgage." (The AEC expect from Commonwealth: 1) quarterly reports on Dresden activities, and 2) continued liaison with GE on technical matters.)

MODIFICATION OF REACTORS should be subject to the AEC's rule-making procedures, according to the Commission's staff counsel, Robt. Lowenstein. In acting recently on GE's Vallecitos reactor license, he expressed the need for a Commission philosophy for defining "how deep AEC controls should extend into the detailed or more generalized operations of licensees."

PEACH BOTTOM REACTOR, proposed by the High Temperature Reactor Development Associates, may run into intervention trouble when the AEC holds hearings on the license application for the project. The Pennsylvania Dept. of Health has already indicated it wants more information pertaining to the determination that the design includes adequate measures to prevent hazards to the public health.

ARMY'S REMOTE A-PLANT, installed in Greenland, went "on the line" last month after a month of testing. It is delivering 1560-kw (net) and supplying 1000-pounds of steam an hour for heating. At the IAEA conference in Vienna recently, the AEC's J. K. Bratton predicted that adaptation of such machines can logically lead to development of machines for civilian use in remote or emergent areas, where they could compete favorably with diesels in appropriate areas even though initial costs are higher.

ATOMS-FOR-PEACE PROGRAM, assessed in the recently released McKinney Report for the JCAE (without the Congressional Committee's endorsement), was found wanting by McKinney, who points out that fissionable material has not been diverted from the military, that Western Europe's efforts have been duplicating and uncoordinated, and that short-term production has been stressed to the detriment of basic research. (The study recommends that the next international conference on civilian A-power emphasize broadening East-West technical relationships, be organized under IAEA rather than the UN, and that it be held in the Soviet Union in 1962.) The report was reportedly toned down to avoid political squabbling. Sen. Anderson (D., N. Mex.), JCAE chairman, is impressed by its "scope and depth." He recognizes that "McKinney's conclusions and recommendations will generate discussion and perhaps argument," and he predicts "thorough consideration" by Congress.

FIRST AIF-ANS MEETING since the Forum membership was polled on preference for sponsorship is attracting industry and government representatives to San Francisco Dec. 12-15. More than 90-percent of 400 members responding to an AIF questionnaire favored AIF-ANS sponsorship to the Engineers Joint Council's; 65-percent favored annual exhibits.

GAS CENTRIFUGE PROCESS for separating isotopes of uranium has yet to be proved cheaper than the diffusion process, the AEC contends in the face of recent publicity concerning the new promise for this process in devices covered by a West German patent. Of special interest is one contention by W. E. Groth of West Germany: Operating costs (of the gas centrifuge process) would be two-thirds raw materials and one-third electric power, a reduction by a factor of about three in overall operating cost.

In the control room of the Dresden Station are seven General Electric engineers of the startup team of 18 who have spent the past year readying this country's largest atomic-electric powerplant for regular commercial operation. They are (l. to r.): D. L. McDaniel; Gerald Parkos; J. A. Haaga, Jr., (manager, Dresden site operations); Richard C. Reid; D. K. Willett, Timothy Pearson; and Robt. B. Hamilton.

ECONOMIC OUTLOOK

by A. C. FARMER
Economic Consultant

Turning Points in the American Economy

Business activity never has continued in a continuous uptrend. Always up-and-down oscillations have been superimposed on the long term trend. For a long time efforts have been made to determine if some regularity in the up-and-down swings of the business cycle would make it possible to employ this information for forecasting purposes.

These studies have been unsuccessful because business cycles are the effect of monetary forces, which in turn exclusively are based on human judgment. In the American economic system the power to control the monetary forces is vested in the Federal Reserve Bank and in the Treasury. Except in time of war, the Federal Reserve Bank can be said to exercise the dominant authority. In time of war, the Treasury comes into the picture largely because of its responsibility to provide war funds, frequently obtained through deficit financing.

In the post-war period of World War II, the Federal Reserve Bank has exercised its authority over monetary forces largely through the control of the Federal Reserve discount rate, which is the rate charged by the Federal Reserve Bank on loans made to the commercial banks.

When the Federal Reserve Bank increases the discount rate, which it does usually in a step-by-step operation, the result is to increase the interest rates on the loans made by the commercial banks. Eventually this increase in the interest rate operates to slow up the borrowing of money, and this in turn operates to slow up business activity, since less money is borrowed and spent.

When the Federal Reserve discount rate is decreased, it has the opposite effect, and when the discount rate reaches a low enough point, the borrowing of money once more is stimulated. Business activity once more begins to improve through the spending of an increased amount of borrowed money.

The purpose in increasing the discount rate invariably is to provide a brake on inflationary trends, when such trends develop in the economy. The purpose in decreasing the discount rates is to stimulate business activity after a down-trend has been established.

The up-and-down changes described clearly are discernible in the statistics for the period from 1947 to 1960. For example, when business declined from 1953 to 1954, as measured by the index of industrial production, the discount rate was lowered from 2-percent to 1½-percent. At that time this was sufficient to stimulate the borrowing of money. Bank loans then expanded and this was paralleled by an uptrend in the index of industrial production.

Simultaneously, the discount rate was increased step by step from 1½-percent in 1955 to 3½-percent at the end of 1957. By that time business had ceased to expand and had begun to slow up quite definitely (note the index of industrial production). To offset this, the Federal Reserve discount rate was lowered in successive steps from 3½-percent in 1957 to 1¾-percent in 1958.

The ensuing improvement shown by the index of industrial production from 1958 to 1960 was paralleled by increases in the Federal Reserve discount rate from 1¾-percent to 4-percent. These increases finally slowed up business expansion and again resulted in a down-trend in the index of industrial production. The Federal Reserve discount rates once more have been lowered in 1960, from 4- to 3½- to 3-percent.

So, it can be seen that, once a new up-trend in bank loans has been established, it takes considerable time for increases in the Federal Reserve discount rate to take effect and to slow down the stimulated business activity. For example, the up-trend in bank loans continued for two years, through 1955 and 1956, before it was interrupted by increased cost of loans. From 1958 to 1960, the up-trend in bank loans continued for about the same length of time.

Also, when the discount rate has been lowered, it has taken six months or longer again to stimulate the borrowing of money and change the trend in the industrial index.

From these relationships, some interesting conclusions now can be drawn about the present and future trends of business activity:

First

The first reduction in the Federal Reserve discount rate, from 4- to 3½-percent, took place early in June, 1960, and from this it can be concluded that a turn-up in general business activity should be taking place in December, 1960. However, since 1960 is an election year, some special interim stimulants may be applied to shorten up the usual time interval.

Second

Once the stimulus to expanding bank loans begins to take effect, it can be expected that the expansion of loans and the up-trend in the index of industrial production will continue for the next two years, through 1961 and 1962.

In spite of many predictions being made to the contrary, this forecast will prove quite accurate. Basic analysis of the American economy shows that no serious economic difficulties are likely to occur in less than five years.

Central administrative offices of the Los Angeles Department of Water & Power are spread through the various buildings indicated by arrows in this view of the downtown area of the city.

PLANNING UTILITY OFFICE SPACE TO MEET FUTURE NEEDS

Space-use programming for present and projected future needs merges the skills of management consultant, architect and economist.

By WALTER C. JACOBS
President
S. U. A., Incorporated

SOARING BUILDING COSTS, expanding population and rapid technological progress in construction and office techniques have combined to focus management attention on the problems of keeping pace with modern office space needs.

These pressures have been responsible for a new approach to office planning that takes into account the inevitable changes in facilities requirements that can be anticipated year-by-year.

A new professional technique has emerged to meet this dual challenge of space-use programming for present and projected future needs. Known as space utilization analysis, it merges the skills of the management consultant, the architect and the economist.

How space utilization analysis can be applied to a public utility is illustrated by the experience of the Los Angeles Department of Water & Power. The Department is planning construction of a new building, the plans for which are based on the results of a space study and projection undertaken by S. U. A., Inc.

Eight Phases Of Study

The steps followed in developing the Los Angeles program show the complex considerations that come into play in planning office needs as far ahead as a quarter century.

The method used in Los Angeles is typical and divides itself into eight phases.

1. An inventory and inspection of existing office facilities—

The S. U. A. field staff began its work by inventorying the Department's present central-office facilities. Sketches were made on floor plans of all space currently occupied, showing each piece of furniture and equipment (with dimensions) in its present location and indicating the principal user.

Each building was also inspected for adequacy of lighting, ventilating facilities, structural elements, soundproofing and elevator facilities. These factors were to become important in determining the feasibility of any future course of action.

2. A functional analysis of present operations, department-by-department and individual-by-individual—

Approximately 125 key officials were interviewed to obtain data on the responsibilities and functions of each departmental unit as well as its relationships with other units. Intra and inter-unit work flow was determined and the relationship between personnel and equipment noted. In addition, such things as filing requirements, conference schedules, operating and employee facilities, were examined and recorded on standardized forms. Cross checks were then made with personnel lists, tables of organization, floor plans and inventory listings.

Other related factors were surveyed such as the time and frequency of inter-building trips, the number of employees driving to work and the adequacy of parking facilities.

3. Evaluation of present space use and requirements—

The heart of the survey was presented on a form called "Unit Data Sheet." These forms, running to several hundred pages, were classified by department and were used not only in dealing with present use and requirements, but also in the later projections noted below.

Under each department all the present employees were listed with the equipment they use. A parallel column listed the equipment proposed to substitute for that now in use. Next to each item of proposed or existing equipment, such as a desk, a file or supply cabinet, the number of square feet required for the item and its functioning was stated. The area allocated was based on certain space standards which are explicitly developed, stated and explained in a large section of the report. These standards, which include both actual space occupied and circulation area required, were established to provide comfortable, rather than maximum or minimal, working conditions.

The sum of the many individual area items provided the net useable area for each department.

In the case of Los Angeles, the evaluation showed a serious lack in certain particular facilities and an over-all deficiency to meet present needs of approximately 37,000 net square feet. The specific places where deficiencies existed were clearly delineated in the unit data sheets. An analysis was made, too, of the relative locations of various departments and facilities. Rearrangements and centralization of certain services were recommended to increase efficiency and reduce time lost in inter-departmental travel.

4. A projection of socio-economic factors affecting community growth and, in turn, increasing demand on the public utility—

The population and industrial growth in the area were projected based on a variety of sources and S. U. A.'s independent techniques. All available records dealing with the past history of the department and the area it serves were examined for growth patterns. The departments own projections and growth were correlated with information from other sources such as The Federal Power Commission, the City Planning Commission and the International City Manager's Association.

These projections, together with others involving such considerations as increases in per capita income, use of power-consuming products and services, and industrial demand, were converted into estimates of future demand on the utility.

5. Translation of the water, light and power demand into a forecast of office-personnel requirements within the utility—

Since the number of personnel required to produce a given amount of output is a function of the growth of productivity of the organization, the per capita employee productivity of the various departments had to be ascertained. This was determined from historical data together with S. U. A. and department projections and converted into a growth personnel forecast. The results were then broken down into divisions, sections and units by a series of "stepdowns" from the most general category to individuals.

6. Translation of the projected growth of office personnel into projections of specific facilities requirements—

The unit data sheets mentioned above were utilized in the projection of future space requirements. Following the listing of current personnel and equipment was one showing the future personnel. These were listed by title and grouped according to the year in which their employment would be required and the recommended equipment was also indicated. Here again, the increments in space requirements is provided by a simple summation of the additional employees and equipment, year-by-year.

7. Development of alternative plans to satisfy the present and projected needs—

The case of the Los Angeles Department was a special one in that, at the time of the study, its central administrative offices were spread through some seven downtown buildings of various ages and conditions and occupied under different financial arrangements. This, of course, posed particular problems not likely to be encountered by other utilities.

Under normal conditions, the present and future net space requirements would first be adjusted to gross space needs. The total picture of present and future needs vs. size, condition and spatial relationships of existing space would provide the bases for an analysis and development of a program. Other factors, too, to be considered are local building costs and availability of suitable space in the area.

8. Determination of relative feasibility of the alternatives and choice of a course of action—

The relative feasibility of the various alternatives, of course, depends also on the peculiar conditions of each case. It is in these determinations and the choice of a specific program that many professional skills as well as the policies of the individual utility management must converge to create a satisfactory and practicable long-term solution.

In Los Angeles, plans are now being drawn by Albert C. Martin and Associates, architects, working closely with S. U. A. on a new large building which will meet the department's requirements until 1985. The new building will rise on a four-square-block site bounded by First, Temple, Hope and Figueroa Streets, which is part of the Los Angeles Civic Center.

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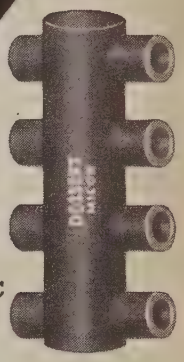

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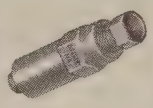
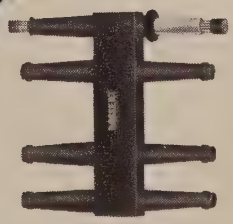
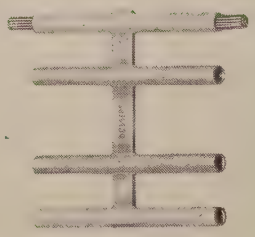


Cable Receptacle type MA

Insulating Sleeve for MICON Outlet type MIS



Insulated Crab Connector type CBR

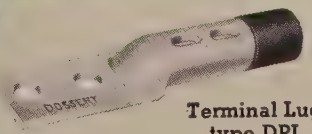


Uninsulated Crab Connector type CBN

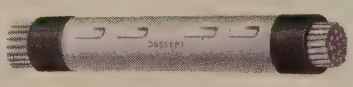
MICON Stud Connector type MCBS

Limiter Link Assembly type LLA

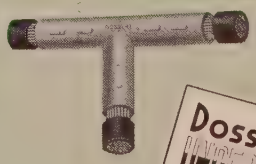
Limiter Link Assembly type NLRA



Terminal Lug type DPL



Comp. Coupler type DPC



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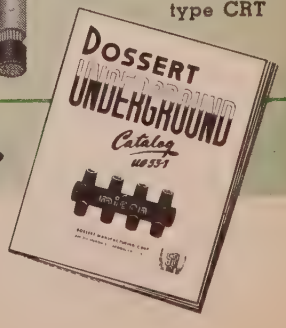

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Chopper Strings Snake River Gap In Minutes

A helicopter and some sturdy nylon ropes helped Washington Water Power and Idaho Power throw Alcoa aluminum conductor across the Snake river south of Lewiston, Idaho—a 3746-ft gap linking the two systems. Nylon ropes were strung by helicopter then were used to winch the three conductors across the river. One by one, the aircraft snaked the ropes across the 900-ft-deep gorge, taking about 15 minutes per crossing.

Nine yellowish-red four by four ft aluminum panels are connected to each static wire to warn pilots.

Study 1000-Mile Transmission Lines

Problems associated with the transmission of electrical energy over distances up to 1000 miles can be solved, according to E. Robert de Luccia, vice-president and chief engineer of Pacific Power & Light, and Joseph K. Dillard, manager of the electric utility engineering dept. of Westinghouse Electric Corp.

Primary purpose of the two-year joint study was to find the answers to problems arising from electrical phenomena associated with circuits exceeding 500 miles in length.

"Voltages up to 690 kv with lines capable of carrying more than 3000 mw of electric power were studied," reported Mr. de Luccia. "With the aid of digital and analog computers, the team was able to determine the effectiveness of corrective devices needed to stabilize the ultra-high voltages over the full length of circuits studied."

"Now that it has been determined that such lines can be operated," said Mr. Dillard, "the utility industry can compare the economics of extra-long distance transmission with the alternate of transporting fuel to power plant at the load centers of the nation and for determining the best possible sites for the large-capacity generating plants that will be required in the future."

Project EHV Already Helping Utilities

As a direct result of Project EHV research, seven utilities have already been aided in their extra-high-voltage planning or problems, according to Dr. Pier A. Abetti, manager of the project for General Electric Co.

Among the new tools and information now available for extra-high-voltage studies are models of towers and lines, Teinographs (lightning waveshape recorders for mounting atop transmission towers), and lightning shielding failure indicators (which record the direction of insulator flashover by means of Lichtenberg figures). Computer programs are employed for determining radio noise, corona loss, and an over-all evaluation of the optimum conductor size, configuration, bundling, and performance of a proposed line.

Announce MHD Meeting

The Second Symposium of Engineering Aspects of Magnetohydrodynamics is to be held at the University of Pennsylvania, Philadelphia, on March 9 and 10, 1961. It is sponsored by AIEE, IAS and IRE. The program is concerned with plasmas in the presence of magnetic field and, in particular, with the engineering aspects of this subject.

Editor's note—

Due to a misunderstanding, the article, "Consolidated Edison Cuts Fault-Locating Costs 50%" in November 1 EL&P, was construed to cover feeder fault location on the *entire* Consolidated Edison feeder system instead of the *d-c feeder* portion of the system, which represents a very small portion of the total system fault-location work.

With respect to the a-c network system, which constitutes the major portion of the Consolidated Edison underground system, the "telemetroscope" device has thus far not been found adaptable to fault location work. Experiments are being conducted wtih the device on network feeders, which Con Ed hopes will indicate some possibility of practical application of the device on work of this nature.

13-KV VERSUS 4-KV DISTRIBUTION— WHICH IS BEST?

Although area economic studies are a major factor, there are many practical aspects that must be considered. Recent analysis of interruption records has shown that 13-kv has equaled the performance of 4-kv. Linemen prefer 13-kv hot-stick work over 4-kv glove work.

By F. G. JOSBERGER, Manager, Distribution Engineering, Meters, Office and Staff Services, Long Island Lighting Co.

AFTER some 14 years of experience The Long Island Lighting Company has evolved the following rules of application for its territory on the subject of 13-kv versus 4-kv distribution:

1. Supply large new loads at 13-kv except in existing high-load-density 4-kv areas.

2. Restrict 4-kv distribution facilities, wherever possible, to their present capability by establishing 13-kv distribution circuits to supply fringe loads. The cutting back of 4-kv areas permits existing 4-kv capacity to absorb load growth within the reduced 4-kv area.

3. Install additional 4-kv capacity at new or existing substations in fairly heavily developed areas now supplied at 4-kv. The load density in some of these areas and the scarcity and difficulty in obtaining substation sites has recently favored the introduction of 13-kv circuits within some of the 4-kv areas.

4. Utilize 13-kv distribution as the supply to underground secondary network systems in high-load-density commercial areas.

Rapidly Growing Area

At the conclusion of World War II, our company was faced with the problem of expanding its electric-distribution system to meet the electric-service requirements of one of the most rapidly growing areas in the country. We had to decide whether we would continue to expand our 4-kv system, which predominated at that time, or whether we would convert and also build new at a higher distribution voltage such as 13-kv. Illustrative of the growth from 1946 to the present are the population and mwh sales statistics for the 1240-sq-mi territory served. During this 14-yr period, population increased from approximately 700,000 persons to almost 2,000,000, or 185 percent, while mwh sales increased 525 percent from 600,000 mwh/year to 3,750,000 mwh/year.

Service Area

The area served by LILCO extends Easterly from the New York City line to Orient and Montauk Points. We have five generating plants with a capacity of 1,071,500 kw. Our transmission system is 138 and 69 kv and our sub-transmission 33, 23 and 13 kv. LILCO, typical of many utilities, reached its corporate structure by the acquisition of many small companies, each of which had designed, built and operated a distribution system adequate for its own needs. Fig. 1 shows the distribution voltage classes existing in LILCO territory in 1946.

The two possibilities in 1946 were:

1. Retain and expand the 4-kv system by reinforcement.

2. Convert existing distribution and build new to a higher voltage such as 13-kv.

It is electrically possible to retain the 4-kv distribution voltage forever, if desired. Thus, if a 4-kv circuit becomes inadequate, sub-transmission can be extended to its mid-point and a new substation installed. This process is the reinforcement process. It incorporates replacement of existing distribution conductors with larger wire sizes where thermal and voltage limitations dictate.

The second method is the establishment of a higher voltage level as a system standard and the conversion of other lower voltage systems to this voltage. All new systems as they are built to supply new loads are then established initially at this higher voltage, forming a contiguous distribution system for any specific area.

The choice of the exact higher voltage to be established as the standard distribution voltage for any company will often depend upon the voltage of the existing sub-transmission system. Since 13-kv existed as a sub-transmission voltage on our system and since substation equipment for this volt-

Editor's Note: This is an adaptation of a paper presented by the author at the 1960 American Power Conference.

age class was available, we selected it as the higher voltage level for study purposes.

Benefits of 13 kv

The following inherent benefits are offered by 13 kv from a design standpoint:

A. Greater load-hauling ability
B. Improved voltage regulation
C. Reduction in losses

Studies of Specific Areas

In order to properly evaluate the economics of the retention and expansion of the 4-kv system as compared to a conversion to higher distribution voltage, area studies were made for double and triple existing load values. The determination of the most economical distribution voltage for a specific area requires the inclusion of transmission, subtransmission and substation facilities as well as the distribution-feeder system.

A typical outline of the study procedure follows:

A. Basic Information Requirements
   1. Define area under study by geographic and/or electrical boundaries.
   2. Develop a composite map of the area showing all substations, 3-phase distribution circuits, existing loads and voltages.
   3. Establish load trends on substations and circuits.
   4. Determine the physical conditions of the existing plant and the operating record of the area under study.

B. Development of Plans
   1. Select the plans of 4-kv reinforcement of the existing system, conversion of the existing system to 13-kv operation, or a combination of these.
   2. Project the loads in accordance with the trends established under basic information and develop the systems under the various plans selected. Prepare estimated circuit loadings, voltage profiles, and loss calculations.
   3. Make economic comparisons of the various plans. In general, develop a system for a 10-yr period or for double or triple load values.
   4. Make an over-all review of the area studies to determine if some other plan or a variation of the plans considered should be included in the study.

Recent Study

In one of our most recent studies in the Huntington area comprising some 31 sq mi, a comparison of three plans evaluated follows:

	Total Demand kva	Total Present Worth of Annual Charges	Total Present Worth Per kva
All 4 kv	60,800	$2,963,000	$48.73
All 13 kv	60,800	4,356,000	71.64
Combination of 4 and 13 kv	37,300— 4 kv 23,500—13 kv	2,819,000	46.37

This study resulted in the selection of the combination plan using both 4 kv and 13 kv in portions of the area studied consistent with the surrounding distribution voltage levels. The combination plan effected substantial reductions in substation costs by retention of 4 kv in portions of the area.

Practical Aspects

The practical aspects, which affect selection of either 13 kv or 4 kv as a distribution voltage level and in some cases prevent implementation of the low cost plan, must be weighed carefully before a decision is made. These include:

A. Restrictions Imposed by Zoning and Local Ordinances
   1. In many cases the limited availability of substation sites in properly zoned locations can cause difficulty in obtaining zoning variances in residential and commercial areas. The load-carrying limitations at 4 kv require more substation sites with less capacity per station as compared to 13 kv which permits fewer stations of larger capacity. As an example, in the southwestern part of our territory, where 4 kv has been retained, our substations are approximately two miles apart. For a similar area at 13 kv the required substations would be five to six miles apart.
   2. Difficulty in obtaining overhead transmission rights-of-way limits the expansion of overhead transmission and sub-transmission lines necessary to supply the greater number of substations required at a lower distribution voltage level.
   3. Restrictions on substation construction may require large expenditures, such as expensive enclosures to blend with the environment in the area, substation transformer noise elimination measures, and large amounts of land-

Fig. 1—Distribution voltage classes in existing LILCO territory in 1946.

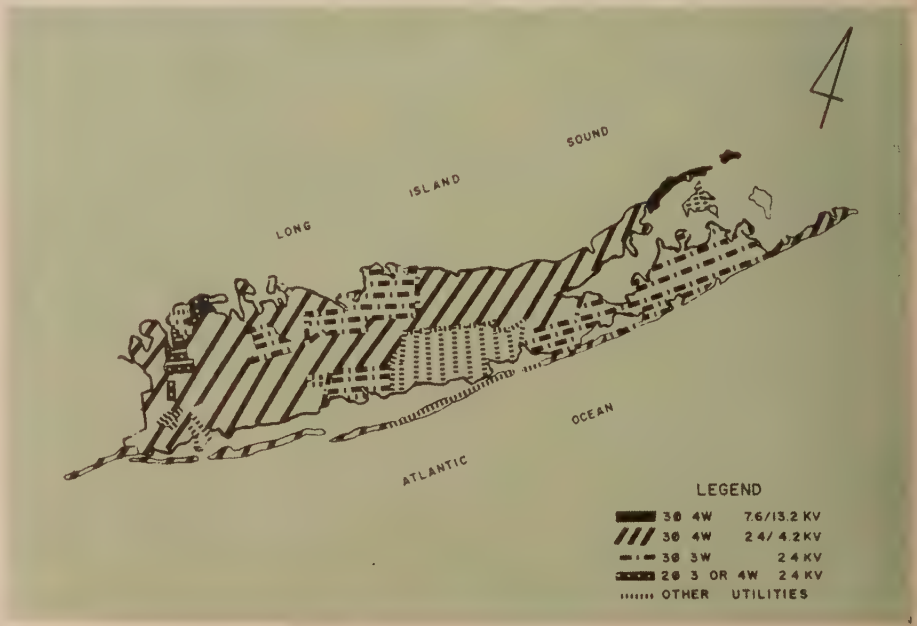

Fig. 2—Typical double-circuit 4-kv pole line.

Fig. 3—Typical single-circuit 13-kv pole line.

scaping to conceal the substation. Under such circumstances, the greater number of stations required with 4-kv systems, as compared to 13-kv systems, results in a greater cost per kva.

B. Restrictions Imposed By Existing Facilities

Existing facilities in and adjacent to the area under study must be considered. Conversion of particular areas which apparently lend themselves readily to 13-kv construction could establish isolated distribution substations and circuits. They may result in poor service continuity because of lack of emergency back-up in the form of distribution field ties and substation capacity. In general, conversion of a particular area to 13-kv should not be considered unless the surrounding system permits future expansion of the higher-voltage system to a point where a firm system is achieved. The shrinking of a 4-kv system to the point of forming an isolated substation should be avoided where possible.

C. Restrictions Imposed by Physical Nature of the Area

Such physical characteristics as street and highway configuration, tree conditions and atmospheric conditions have an important influence in deciding the voltage level to be used.

1. Where there is a lack of available main-circuit routes, 13 kv is a more desirable voltage level because with its load-hauling ability fewer main circuit routes are required. Likewise, fewer routes are required for branch circuits to supply single-phase load; based on load-carrying ability, a 13-kv single-phase tap is equivalent to a three-phase tap at 4 kv. As a specific example, for initial design we limit the connected transformer capacity on a No. 6 single-phase tap to 100 kva at 4 kv and 300 kva at 13 kv.
2. Tree conditions along distribution routes have always presented a problem of service continuity to utility companies, and the use of 13-kv distribution has tended to magnify this problem. It has been our experience that more thorough and frequent tree trim is required to maintain a good service record at 13 kv than at 4 kv for bare open-wire construction. However, this is tempered somewhat because of the fewer miles of polyphase circuit required at 13 kv and the simplified ridge-pin construction on single-phase lines reduces the amount of tree trimming needed in a specific region.
3. Another condition which must be considered in those areas in our territory which border on the shore line is salt fog or spray. To minimize burning of crossarms and poles by leakage currents, special higher-cost construction at 13 kv is required using fog-type insulators and bushings.

D. Flexibility in Meeting Load Growth

In our territory, load growth in the past 14 years, as previously shown, has not only been rapid but it has also developed in a rather unpredictable geographical pattern. In these circumstances, flexibility of 13-kv distribution has been of vital importance because it has permitted prompt servicing of new and increased loads. Some examples of the flexibility realized by 13 kv are:

1. The ability to continue to serve 4 kv to existing areas by use of stepdown banks while extending 13 kv to new load centers. This device permits the spreading out of investment required to meet load growth.
2. During periods of critical manpower and material shortages consumer service dates may be more readily met by extending the 13-kv distribution far beyond design limits to pick up load. To supply the same load at 4 kv would require immediate investment in

(Continued on page 64)

Fig. 4—Existing types of distribution in LILCO territory in December, 1959.

PRESSURE FILLING PROCESS DOES BETTER POTHEAD JOB

Pressure filling of low-voltage potheads under controlled temperature conditions has gone far to lick the filling compound voiding problem.

By
ARTHUR GODOSHIAN
Engineer—Cable Performance, and
ROLAND HENDERSON
Engineer—Underground Lines
The Detroit Edison Company

PRESSURE filling of distribution voltage class potheads with asphaltic compound has become standard procedure on the system. It has proven itself in construction time savings and in a better filling job.

Formerly, standard low-voltage pothead filling practice was based on gravity flow with the use of standpipe and vent pipe. Last year, however, evidence of incomplete fillings showed itself.

Failure early in 1959 of a 7.5-kv angle-type pothead after three and one half years service was determined to be due to a voltage surge. Further investigation revealed that the volume of compound in the pothead was insufficient to permit it to withstand the standard 95-kv impulse test. Field examinations confirmed our suspicions that others might have been incompletely filled.

At this point an investigation was undertaken to find the cause of these incomplete fillings and to amend our pothead filling procedure specifications as necessary.

Basically two questions were involved in this investigation:

Fig. 2—Lineman demonstrates cold weather procedure of pre-heating the filling hose and vent tube. Note flexible connection between filling tank and pothead.

Fig. 1—Complete layout of pressure filling kit for potheads.

1. How to overcome compound shrinkage due to contraction from a high temperature to a lower ambient temperature.

2. How to fill a pothead consistent with good operating practice and in as short a time as possible.

Limitations of Compound

Asphalt-type pothead filling compound not only has an extremely poor thermal conductivity but a relatively large thermal coefficient (0.0004 in. per in. per degree F). It was because of this large expansion and the following reasons that gravity type filling was discarded. For the compound to be sufficiently fluid to pour, its temperature had to be a minimum of 250F. At any lower temperature the rate of flow would be unsatisfactory. However, at this elevated temperature, large voids, due to contraction, occur. To overcome this, a long cooling period, generally one hour, had been necessary to permit the main body of compound to reach a minimum volume. The filling pipes were then transferred to the top filling hole and the fill completed. To reduce the filling time, it was decided to investigate the practicality of filling these potheads at a lower compound temperature under pressure.

Build Special Container

At a very nominal cost a thermostatically controlled, electrically heated, container was designed and built. It is a pressure-operated vessel and similar in appearance to a garden spray tank. The required pressure of 40 psi is obtained from a 24 cu ft nitrogen bottle and pressure regulator. See Figure 1.

The tank thermostat setting of 160F was determined from the pothead's maximum operating temperature. It was calculated that at full load on a hot summer day, the maximum temperature would be 150F. Therefore, if the pothead is completely full at 150F, then the void volume due to shrinkage from 150F to ambient, is merely an expansion chamber. Conversely, filling full at too low a temperature can cause excessive internal pressures and result in compound leaking out from under the gasket seals.

To determine if the pressure-filling method could be used at low ambient temperatures, a pothead was constructed and filled in a cold room. At a cold-room temperature of 8F, six gallons of compound were heated and the pothead filled. Complete filling and sealing time took less than 30 minutes. Heating time for the compound was three and one half hours, which is not objectionable since the construction time of the pothead is about four hours.

Method Works On 13.2 kv, Too

The pressure-filling method solved special problems which were too hard to solve with gravity-type filling method on our recently introduced 13.2-kv distribution system. The 15-kv vertical potheads used on this system were not readily adaptable to gravity filling because of the 45-degree angle at which they are hung.

First, the filling holes are not accessible for long filling pipes; and second, because of the angle, it was impossible to avoid entrapped air in the uppermost corner of the lid.

With the pressure tank, we were able to fill our 15-kv potheads quite easily. The entrapped air is vented by a special fitting and a ¼-in. copper tube attached at the lid vent hole and bent to such a curve as to permit the air to escape. The tube is removed after filling, and the pothead is sealed.

The container itself is of sufficient capacity to fill two 7.5-kv potheads or one 15-kv pothead. For purposes of safety, a 75 psi rupture disc has been installed even though the compound temperature is low enough to prevent any serious accidents. The tank meets all standards of ASME for unfired pressure vessels.

When the vessel is refilled, all freshly added compound is required to be maintained at a temperature of 250F for one hour to insure moisture-free compound.

Our first filling attempts, with hood vent screws removed, showed compound to fill completely the space between the internal ferrules and the crimp-type hood. This was considered unsatisfactory until a conductivity test indicated this compound around the ferrules in no way interfered with its electrical operation.

The acceptance rate by the splicers has been good. In addition to savings in construction time further savings are achieved by purchasing the asphaltic compound in larger packed units.

Splicer's Procedure For Filling Potheads

Fig. 1—Splicer's Procedure For Filling Potheads

After checking out a pothead filling tank (tank to be transported in an upright position) and kit from the Cable Plant, the splicer should:

1. Plug the compound heater unit into a 120-v source when arriving on the job (at least three hours before filling time). Prior to filling, check the compound temperature. Temperature should be 160F.

2. When ready for filling, unplug the heater and hoist the pressure tank onto the platform.

3. Release pressure in filling tank by depressing Schrader valve. Connect hose from filling tank to bottom filling hole of pothead.

4. Loosen vent screws in top of bushings.

5. Install a vent in the uppermost corner of the pothead lid. For the 15-kv pothead install the ¼-in. copper tube with valve so curved as to vent the uppermost corner of pothead. For the 7.5-kv pothead install the 14-in. x 12-in. nipple with a valve on the end.

6. With Insto-torch preheat filling hose and vent tube in cold weather; continue applying heat until filling is completed. See Fig. 2.

7. Apply 40 psi pressure to the filling tank. When compound appears at top of vent pipe close the valve.

8. Lightly heat top bushings. When compound appears at top bushings, tighten vent screws.

9. Release pressure in pressure tank and leave the hose valve open for one minute to relieve any excess pressure in pothead body.

10. Seal pothead by inserting all plugs and solder over top vent screws.

11. Return all pressure tanks and tool kits to the Cable Plant for servicing.

ONE APPROACH TO LOGGING STEAM-STATION PERFORMANCE

Monitoring and automatic logging at NYSE&G's Milliken Station provides monthly check on magnitude of losses or gains in efficiency arising from deviation from design values.

By S. A. LYON System Results Engineer
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PRESENT PRACTICE in the acquisition and use of data pertinent to the functioning of steam-electric generating station equipment varies from that employing a relative minimum of automation to that utilized in the fully-automatic gas-fired station.

Between these two extremes there presently exist a wide range and variety of approaches.

It is the purpose of this article to briefly describe the objectives, the methods and the accomplished and potential results of one approach to this problem as applied to a two-unit coal-fired station of moderate size.

Broad Objectives of the Approach

When planning for the second 150-mw, 1800 psig, 1000° unit for New York State Electric & Gas Corporation's Milliken Station was in progress in early 1956, it became apparent that:

1. Economy in operating manpower should result from installation of monitoring equipment covering a large number of temperatures and pressures not otherwise centrally monitored.
2. Improved thermal efficiency and better loading of units might result from automatic logging of selected operating data combined with automated data reduction and manual or automatic performance analyses based thereon.

Supporting the second of the above items were our several years of experience in semi-automated analysis of a limited amount of manually-logged data for Milliken No. 1 Unit as well as for two other reheat units in our system.

Secondary objectives which it was expected would be realized from such an installation were:

1. Better protection of operating equipment.
2. Experience in the emerging field of automatic digital monitoring and computation of performance indices.

Reasons for Choice of This Approach

Careful analysis of the then "state of the art" indicated to us that, while theoretically ideal, the continuous, automatic and instantaneous (real time) computation of heat rates, boiler efficiences, etc. as reliable guides to minute-by-minute operation was of doubtful value at that time. Furthermore, the absolute accuracy of operating instruments and transducers then available, the presence of "transients" in the thermal cycle and the complexity of the cycle interactions involved were such as to suggest that little improvement might result from "real time" over-all computer control.

Description of Equipment Installed

It was therefore decided to install:

1. (MONITOR) A digital system which would continuously scan some 250 temperatures and pressures not otherwise centrally reported and which would:
   A. Compare the value of each such temperature or pressure with a predetermined but adjustable limit, and alarm when such limit was reached or exceeded.
   B. Print out date, point identification, time and digital value of each point so alarmed.
   C. Permit "demand" printouts of any or all values

monitored.

D. Log hourly the digital values of all temperatures and pressures so monitored.

2. (PERFORMANCE DATA LOGGER) A digital system which would log hourly some 80 (plus) instantaneous or integrated values of performance data and which would:

A. Simultaneously prepare a 5-channel punched tape of these data for automatic conversion to cards or other data-reduction medium.

B. Be of modular construction to facilitate maintenance.*

C. Be "all electronic" in its linearizing, null detecting and digitizing circuits. *

D. Incorporate a test panel for locating faults. *

E. Include a "patch panel" to permit flexibility in re-arranging its program.*

F. Include four "dialable" four-digit input simulators to permit maintenance of input instruments and transducers without loss of logged and taped data.

G. Utilize "Teletype" printer for printout. *

H. Read and record a standard "check voltage." *

Description of Information Checked or Recorded

As the continuous checking of items by the monitor is designed to protect equipment by indicating abnormal operation prior to failure, a detailed listing of the items monitored is probably not justified here. Temperatures of bearings of auxiliaries comprise the bulk of the items monitored.

A corollary to protection of equipment is economy of operating manpower.

Of greater specific interest may be the performance data logged. Fig. 1 is a reproduction of a 24-hour log sheet for Unit No. 1. The corresponding data for Unit No. 2 are also logged and taped.

Reduction of Data and Computation of Results

The typed performance-data log sheets are utilized chiefly at the station where the plant foreman scans the typed data after each hourly print-out.

Since the automated reduction of performance data is currently based upon punched cards automatically prepared from the punched tape, the card format is important. Fig. 2 shows the completed detail cards corresponding to the 15th hour on the log sheet of Fig. 1.

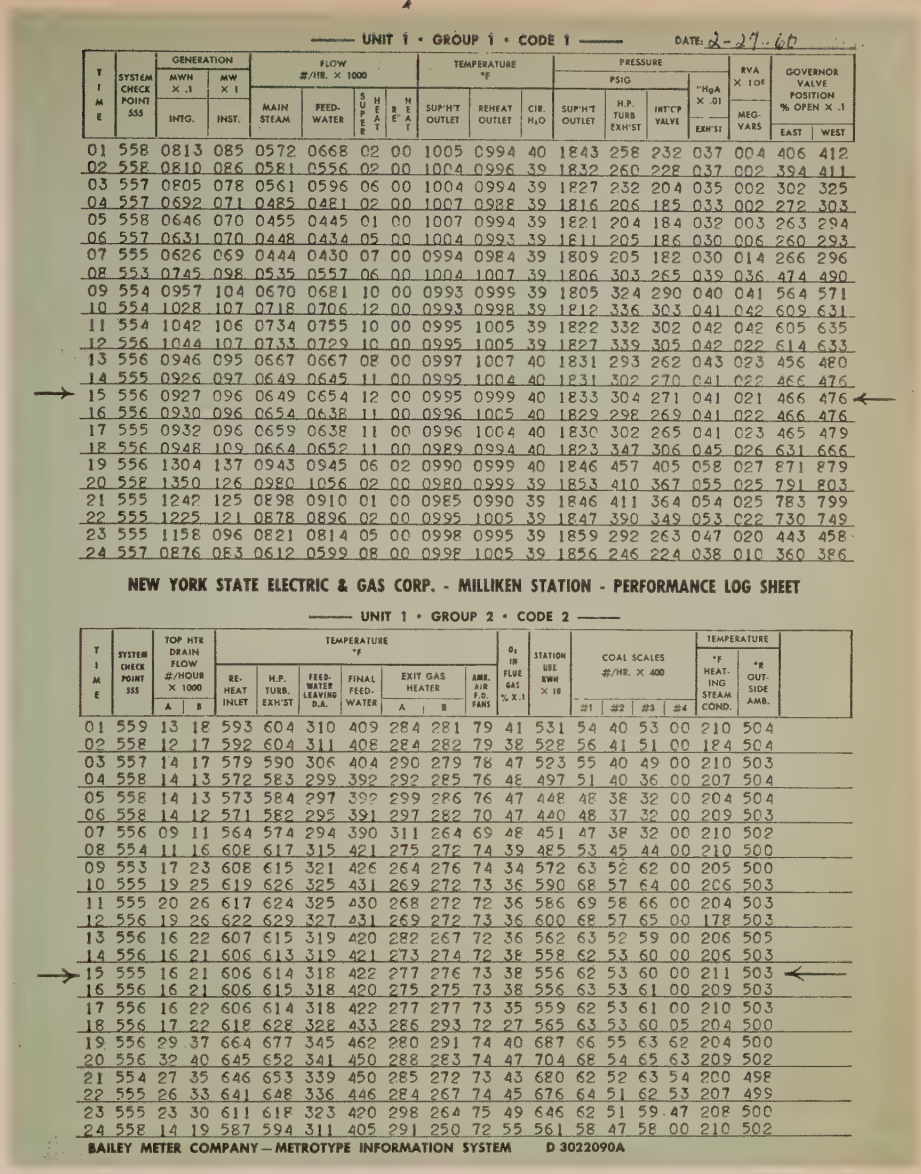
As it is impossible to record all of the data for one hour for one unit on a standard 80-column card, the same *correlating information* is recorded in the first 18 columns of each card shown.

This permits sorting and correlating any or all recorded data with respect to month, day, year, code, hour, check point, hourly generator output or instantaneous rate of generator output.

At present our data reduction is done by means of electric-accounting-machine equipment used for customer billing. Our routine processing is therefore geared to this equipment, the most pretentious item of which is a 607 wired-program computer. However, our data are such that we expect to readily and advantageously utilize more advanced facilities when they become available.

After tape-to-card conversion by means of an 046 Tape-To-Card Punch, which is also used in our commercial accounting as a manual key punch, the approximately 3000 cards (180,000 digits) per month are sorted by code number. They are thus grouped by generating unit and by card format for each such unit.

At this point we may sort the cards by "check point" to determine whether or not the logger has, in each card, correctly evaluated the



— UNIT 1 • GROUP 1 • CODE 1 — DATE: 2-27-60

TIME	SYSTEM CHECK POINT 555	GENERATION MWH × .1 INTG.	GENERATION MW × 1 INST.	FLOW #/HR. × 1000 MAIN STEAM	FLOW #/HR. × 1000 FEED-WATER	FLOW #/HR. × 1000 SUPER HEAT	FLOW #/HR. × 1000 RE HEAT	TEMPERATURE °F SUP'HT OUTLET	TEMPERATURE °F REHEAT OUTLET	TEMPERATURE °F CIR. H_2O	PRESSURE PSIG SUP'HT OUTLET	PRESSURE PSIG H.P. TURB. EXH'ST	PRESSURE PSIG INT'CP VALVE	"HgA × .01 EXH'ST	RVA × 10⁶ MEG-VARS	GOVERNOR VALVE POSITION % OPEN × .1 EAST	GOVERNOR VALVE POSITION % OPEN × .1 WEST
01	558	0813	085	0572	0668	02	00	1005	0994	40	1843	258	232	037	004	406	412
02	558	0810	086	0581	0556	02	00	1004	0996	39	1832	260	228	037	002	394	411
03	557	0805	078	0561	0596	06	00	1004	0994	39	1827	232	204	035	002	302	325
04	557	0692	071	0485	0481	02	00	1007	0988	39	1816	206	185	033	002	272	303
05	558	0646	070	0455	0445	01	00	1007	0994	39	1821	204	184	032	003	263	294
06	557	0631	070	0448	0434	05	00	1004	0993	39	1811	205	186	030	006	260	293
07	555	0626	069	0444	0430	07	00	0994	0984	39	1809	205	182	030	014	266	296
08	553	0745	098	0535	0557	06	00	1004	1007	39	1806	303	265	039	036	474	490
09	554	0957	104	0670	0681	10	00	0993	0999	39	1805	324	290	040	041	564	571
10	554	1028	107	0718	0706	12	00	0993	0998	39	1812	336	303	041	042	609	631
11	554	1042	106	0734	0755	10	00	0995	1005	39	1822	332	302	042	042	605	635
12	556	1044	107	0733	0729	10	00	0995	1005	39	1827	339	305	042	022	614	633
13	556	0946	095	0667	0667	08	00	0997	1007	40	1831	293	262	043	023	456	480
14	555	0926	097	0649	0645	11	00	0995	1004	40	1831	302	270	041	022	466	476
15	556	0927	096	0649	0654	12	00	0995	0999	40	1833	304	271	041	021	466	476
16	556	0930	096	0654	0638	11	00	0996	1005	40	1829	298	269	041	022	466	476
17	555	0932	096	0659	0638	11	00	0996	1004	40	1830	302	265	041	023	465	479
18	556	0948	109	0664	0652	11	00	0989	0994	40	1823	347	306	045	026	631	666
19	556	1304	137	0943	0945	06	02	0990	0999	40	1846	457	405	058	027	871	879
20	558	1350	126	0980	1056	02	00	0980	0999	39	1853	410	367	055	025	791	803
21	555	1242	125	0898	0910	01	00	0985	0990	39	1846	411	364	054	025	783	799
22	555	1225	121	0878	0896	02	00	0995	1005	39	1847	390	349	053	022	730	749
23	555	1158	096	0821	0814	05	00	0998	0995	39	1859	292	263	047	020	443	458
24	557	0876	083	0612	0599	08	00	0998	1005	39	1856	246	224	038	010	360	386

NEW YORK STATE ELECTRIC & GAS CORP. - MILLIKEN STATION - PERFORMANCE LOG SHEET

— UNIT 1 • GROUP 2 • CODE 2 —

TIME	SYSTEM CHECK POINT 555	TOP HTR DRAIN FLOW #/HOUR × 1000 A	TOP HTR DRAIN FLOW #/HOUR × 1000 B	TEMPERATURE °F RE-HEAT INLET	TEMPERATURE °F H.P. TURB. EXH'ST	TEMPERATURE °F FEED-WATER LEAVING D.A.	TEMPERATURE °F FINAL FEED-WATER	TEMPERATURE °F EXIT GAS HEATER A	TEMPERATURE °F EXIT GAS HEATER B	TEMPERATURE °F AMB. AIR F.D. FANS	O_2 IN FLUE GAS % × .1	STATION USE KWH × 10	COAL SCALES #/HR. × 400 #1	COAL SCALES #/HR. × 400 #2	COAL SCALES #/HR. × 400 #3	COAL SCALES #/HR. × 400 #4	TEMPERATURE °F HEATING STEAM COND.	TEMPERATURE °R OUTSIDE AMB.
01	559	13	18	593	604	310	409	284	281	79	41	531	54	40	53	00	210	504
02	558	12	17	592	604	311	408	284	282	79	38	528	56	41	51	00	184	504
03	557	14	17	579	590	306	404	290	279	78	47	523	55	40	49	00	210	503
04	558	14	13	572	583	299	392	292	285	76	48	497	51	40	36	00	207	504
05	558	14	13	573	584	297	392	299	286	76	47	448	48	38	32	00	204	504
06	558	14	12	571	582	295	391	297	282	70	47	440	48	37	32	00	209	503
07	556	09	11	564	574	294	390	311	264	69	48	451	47	38	32	00	210	502
08	554	11	16	608	617	315	421	275	272	74	39	485	53	45	44	00	210	500
09	553	17	23	608	615	321	426	264	276	74	34	572	63	52	62	00	205	500
10	555	19	25	619	626	325	431	269	272	73	36	590	68	57	64	00	206	503
11	555	20	26	617	624	325	430	268	272	72	36	586	69	58	66	00	204	503
12	556	19	26	622	629	327	431	269	272	73	36	600	68	57	65	00	178	503
13	556	16	22	607	615	319	420	282	267	72	36	562	63	52	59	00	206	505
14	556	16	21	606	613	319	421	273	274	72	38	558	62	53	60	00	206	503
15	555	16	21	606	614	318	422	277	276	73	38	556	62	53	60	00	211	503
16	556	16	21	606	615	318	420	275	275	73	38	556	63	53	61	00	209	503
17	556	16	22	606	614	318	422	277	277	73	35	559	62	53	61	00	210	503
18	556	17	22	618	628	328	433	286	293	72	27	565	63	53	60	05	204	500
19	556	29	37	664	677	345	462	280	291	74	40	687	66	55	63	62	204	500
20	556	32	40	645	652	341	450	288	283	74	47	704	68	54	65	63	209	502
21	554	27	35	646	653	339	450	285	272	73	43	680	62	52	63	54	200	498
22	555	26	33	641	648	336	446	284	267	74	45	676	64	51	62	53	207	499
23	555	23	30	611	618	323	420	298	264	75	49	646	62	51	59	47	208	500
24	558	14	19	587	594	311	405	291	250	72	55	561	58	47	58	00	210	502

BAILEY METER COMPANY—METROTYPE INFORMATION SYSTEM D 3022090A

Fig. 1—Twenty-four hour performance—Data Log Sheet for Unit No. 1.

* *Items 2 B, C, D, E, G and H apply also to monitor (Item 1)*

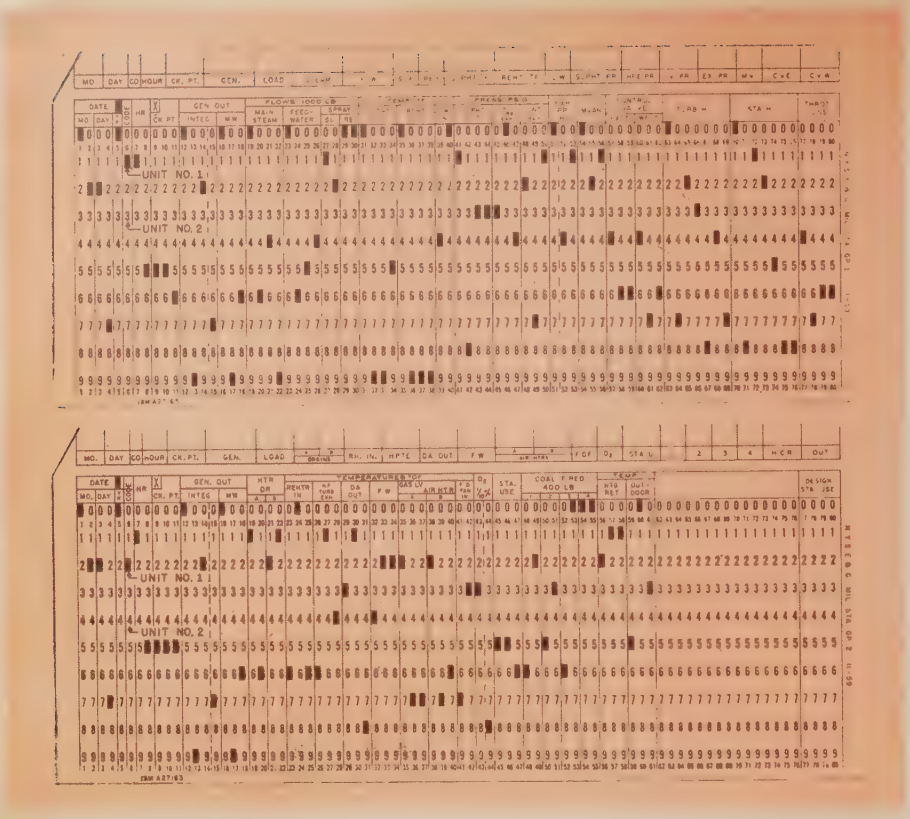


Fig. 2—Completed detail cards corresponding to 15th hour on log sheet of Fig. 1.

analog voltages comprising its instantaneous inputs.

Routinely the cards are next sorted, within the code-number groups, by whole megawatthours and certain load-correlated "constants" are punched into the cards from master decks.

They are then listed and tabulated by these load groups. (See Fig. 3.) This provides a basis for:

1. Averaging of data for use in:
   a. Calculation of coal rate, turbine heat rate, boiler efficiency (by losses), condenser performance, etc., at a large number of load levels.
   b. Utilization of data to determine extent to which deviation of such items as throttle pressure, throttle temperature, reheat temperature, exhaust pressure, etc. have affected turbine cycle efficiency; both at specific load levels and over-all for the period being analyzed.
2. Use of the 607 computer to produce the many products necessary for computation of "weighted averages" of steam pressure, temperature, etc. needed for realistic preparation of a monthly turbine heat rate.
3. Determination of over-all "design" and "modified design" heat rates for the actual loading imposed during the month.
4. Spotting of indicated deviations in performance parameters at any given load.

Although the card format which is used for codes 1 and 3 (See Fig. 2, upper) utilizes only the first 62 columns for recording of logged data, it will be noted that three additional fields are shown.

Two of these fields, "turbine heat input" and "station heat input" are used in order that the true design heat rates, both turbine and station, may readily be determined for each unit for the month. This is accomplished as follows:

For each value of load on the unit there exist unique design values of both turbine and station inputs for each hour of operation. These values, together with the corresponding whole megawatts of load, are contained in a master deck for each unit.

After the cards have been sorted by load they are automatically punched with the appropriate design heat-input data from the master decks. Tabulation of the completed detail cards then results, along with other values previously described, in *the total design heat input for the unit, as actually loaded, for the entire month.*

Division of this total design heat input, either turbine or station, by the total net generation for the month, gives the *true design heat rate* for the unit as actually loaded.

Comparison of the *actual heat rates* with the *design heat rates* provides a standard for evaluation of over-all performance.

However, there are a considerable number of factors (throttle pressure and temperature, reheat temperature, exhaust pressure, governing valve position, leakages, etc.) which markedly modify design heat rate and which may or may not be wholly under the control of the operators.

It is therefore unrealistic to expect that the *actual heat rate* will agree with the *design heat rate* arrived at as described above.

Therefore, as previously mentioned, the effects of recorded deviations in these factors are evaluated and the strictly design heat rate for the month is modified to take into account the effect of these deviations. The resulting *modified design heat rate* is a realistic standard with which to compare the actual over-all *heat rate* for the month.

Difference between *"actual"* and *"modified design"* heat rates is reported as "difference unaccounted for" and, depending on its magnitude, may be considered a basis for testing or other procedures aimed at discovering and correcting the cause of the unaccounted for loss.

One obvious advantage of the foregoing procedure is that it provides a monthly check on the magnitude of the losses (or *gains)* in efficiency arising from deviation from design values of each of a number of items logged. Since these are obtained as btu per kilowatthour they can readily be translated into dollars of annual fuel cost and decisions regarding maintenance, design or operating changes can be based thereon.

In a manner somewhat similar to that described for the "turbine heat input" and "station heat input" fields in the code 1 card of Fig. 2, other special fields in the detailed data cards may be provided with design or test data from master decks

and may play their part in evaluation of "deviations from design."

Operating Experience and Economic Justification

While not all of the above outlined and other potential benefits of this equipment and procedure have yet been realized, the method of data reduction and analysis outlined in some detail has been in effect for approximately eight months using automatically logged and taped data.

We have experienced some annoying problems with this equipment and its associated transducers, but have overcome many of these and believe that most of those remaining can and will be successfully met, with the exception that, as anticipated initially, the over-all accuracy of data is not as good as would be obtained with true test instrumentation.

The fact that our basic concept called for *automatic* conversion of data to card format and for largely automated reduction of data placed a high priority on minimization of *all* taped errors which might require manual correction.

During the first six or seven months of operation many difficulties arose, which made it impractical to permanently file copies of all log sheets and to process all taped data.

However, by October 1, 1959 it was believed desirable to file all such logs and to put our automated routine of conversion and reduction into regular use, supplemented by manual preparation of corrections when and where required.

Some idea of the over-all reliability of the performance-logger installation may be obtained from the fact that for the period October 1, 1959 through March 31, 1960 the equipment was in service and produced the typed log and/or the tape on its hourly print-out 99.64 percent of the time.

Moreover, if we omit October 1, only, from this period, the "in-service at log-out time" percentage becomes 99.95 percent. Unfortunately, however, a relatively large number of errors still require manual keypunching of correction cards.

In spite of the foregoing, it is felt that this equipment and method are worthwhile and that they secure results which we could not hope to accomplish by wholly-manual methods of logging or data reduction.

During the same six-month period the monitoring system, which has a higher cycling frequency (18 cycles per hour) but which handles a lesser variety of inputs than does the performance logger, was in service and producing satisfactory data an average of 98.4 percent of the time for the two units. It is estimated that forced outage of the monitor accounted for about 30 percent of the out-of-service time, and that preventive maintenance, adjustment, etc. required approximately 70 percent of the time during which the equipment was not producing satisfactory results.

Economics in operating manpower arising from the monitoring and performance-logging equipment more than justify the cost of the dual installation.

At least three bearings (boiler feed pump, Ljungstrom air heater and air heater motor) have been "saved" by the monitoring system, while more comprehensive and usable performance data result from the performance logger.

Familiarity with automatic logging data reduction is being acquired and operators and station-results personnel are being encouraged to increasingly analyze the factors affecting thermal efficiency.

Fig. 3—A portion of one of the monthly routine tabulation sheets. Arrow indicates line containing some of the data from Code 2 card of Fig. 2.

MONTH Feb.
YEAR 1960

MILLIKEN STATION, UNIT NO 1 GROUP 2 DATA CODE NO 2 (2,4) PG 1

CODE	GENERATION MWH	NO. HRS	DAY	HR	CK PT	LOAD MW	HTR DRAIN 7A	HTR DRAIN 7B	COAL SCALES 1	COAL SCALES 2	COAL SCALES 3	COAL SCALES 4	METERED STA USE	DESIGN STA USE
2	90	1	13	2	555	89	16	21	64	50	53		555	
2	90	1	16	7	555	102	15	20	64	54	55		561	
2	90	1	8	5	555	96	15	21	61	47	57		550	
2	90	1	14	23	555	94	15	21	65	51	53	4	571	
	990	11				1041	169	226	707	555	588	4	6131	
2	91	1	5	7	555	104	15	21	67	51	57		557	
2	91	1	9	4	555	90	16	21	60	45	55		550	
2	91	1	3	3	555	94	16	20	63	49	56		562	
2	91	1	22		557	82	17	21	63	49	55		550	
2	91	1	24	2	560	94	16	21	68	54	47		554	
	455	5				464	80	104	321	248	270		2773	
2	92	1	26	2	559	90	17	22	66	49	63		545	
2	92	1	20	15	556	95	16	21	62	49	62		568	
2	92	1	20	16	556	95	16	21	62	50	60	1	566	
2	92	1	20	13	557	96	15	21	62	47	61		568	
2	92	1	20	14	557	95	16	21	62	50	62		566	
2	92	1	27	14	556	97	16	21	62	53	60		558	
2	→ 92	1	27	15	555	96	16	21	62	53	60		556	
2	92	1	21	22	558	87	15	21	64	49	57		589	
2	92	1	17	1	555	98	16	20	66	53	59		558	
2	92	1	18		557	87	15	20	65	50	59		559	
2	92	1	20	12	555	95	17	21	62	50	62		570	
2	92	1	7	17	555	108	16	22	65	49	58		561	
	1104	12				1139	191	252	760	602	723	1	6764	

One of Portland General Electric Company's line crews performing overhead line work but charging their time as described in this article.

OVERHEAD LINE LABOR DISTRIBUTION THE EASY WAY

Simplified labor-accounting distribution devised by Portland General Electric relieves line foreman of responsibility for distinguishing between maintenance and construction charges.

By
RODNEY P. COLTON
Internal Auditor
Portland General Electric Company

LET'S TAKE A LOOK at this fellow, the line foreman, to see what is expected of him if he is to do a good job. He must be a competent superviser so that there is complete harmony among his crew members. He must be a safety expert so that his crew members will not cook themselves on a hot lead. This can be a real problem when his crews are spread out over a mile of line. He must be an expediter who can meet the schedules handed down from top management. He must be an accountant since he is the only one who knows what's going on in the field. His penmanship may cause some concern, particularly when his hands are so cold that he can hardly bend his knuckles. Unquestionably the line foreman is a very qualified employee in his own right, but what about the accounting responsibilities placed on him?

Electric-utility accounting poses problems to even the experienced accountant; but the man suddenly thrust into the position of line foreman with little accounting instructions must immediately assume responsibility for distinguishing between maintenance and construction charges. Small wonder, therefore, that he sometimes seems to reason that everything that goes up is a capital expenditure and everything that comes down is a retirement. It's further understandable why foremen frequently distribute time charges arbitrarily rather than attempting to make the precise labor distributions required to accurately record the work done. It's not unusual for the job-estimator to work hand-in-hand with the foreman so that actual time charged will be close to the time estimated. These are the factors which prompted Portland General Electric Company's management to attempt to devise a simplified labor-accounting distribution for all overhead line construction.

Overhead line work at PGECo is covered by formal work-order estimates on jobs with expenditures in excess of $7000; minor jobs with expenditures of less than $7000 are covered on job orders.

The bulk of the labor distribution originates on minor jobs or job orders. Frequently it is necessary to distribute labor charges to seven or eight accounts on one job order. A crew may do as many as four jobs a day. Simple mathematics will indicate it's a complicated matter to distribute eight crew hours to 32 accounts.

Some utilities have simplified labor-distribution systems for minor jobs which relieves the line foreman of charging crew time directly to the accounts. Usually, however, office clerks by various means allocate the crew hours to the accounts which would have been normally charged by the crews, thereby simply transferring the labor accounting distribution from operating to clerical personnel. This did not appear to be a decided improvement.

Periodic studies of minor overhead-line-construction jobs led the PGE accounting staff to believe that minor job orders could be classified by job types. For example, it appeared to the staff that labor charges on jobs providing for a transformer installation would always be to substantially the same accounts, and the only variation in the labor charges between jobs would be in the amount of time spent. To prove this theory, 2300 job orders were reviewed, and it was found that approximately 90% of the jobs could be classified into one of 19 job types. For all practical purposes, the labor charges were common for all jobs within each type.

Two examples of the job types and related accounting distributions determined by the analysis of the 2300 job orders are shown in the accompanying box section of this article.

With this information it was possible to design a system for distributing labor charges on a 604 IBM calculator. For each job type, a set of labor distribution cards was key punched containing the accounts and related percentages for distributing labor. PGECo has responsibility-area accounting, so it was necessary to key punch a set of distribution cards for each responsibility area. The labor-distribution cards for all job types and responsibility areas were merged in chronological order and referred to as the "Master Labor Distribution File."

Now the line crews simply charge their time to the job order and job type numbers. The time sheets are key punched and each month summary cards are produced for all labor charged by responsibility areas and job types. The summarized labor cards are merged with the master labor-distribution file and the 604 calculator prepares labor-distribution cards containing the computed labor charges and related accounting distribution for each job type.

Major jobs, or formal estimates, could not be classified by job types, since each provided for a specific installation not common to other jobs. However, by establishing a new account — Undistributed Construction Labor — the same method of distributing labor charges against formal work order estimates could be used as for distributing labor charges on job orders.

The labor distribution for formal work-order estimates is determined by the Engineering Department when the estimate is prepared. For each estimate a set of labor-distribution cards is key-punched containing the accounts and related percentage distribution. These cards are filed in chronological order in the master labor-distribution file used for job orders.

The line crews charge all time spent on formal work-order estimates to the Undistributed Construction Labor account. Each month the labor charges are summarized and distributed in the same manner as outlined for job orders.

This system has resulted in many benefits. It has substantially reduced key-punching time in the machine room. Also, better accounting for labor charges is obtained on job orders and formal estimates. This system met with immediate success with the operating personnel, who always felt it was the line-foreman's responsibility to install the materials and it was the accountant's responsibility to make the proper accounting.

Job Type 6—Transformer Replacements or Removals

Includes but not limited to:

Job Description:

(1) Replacing or removing transformers.
(2) Removing transformer racks.
(3) Pole removals in conjunction with transformer removal.
(4) Replacing, removing or transferring service drops.
(5) Replacing or removing not more than 1000 feet of wire.
(6) Miscellaneous rearrangement of pole and line hardware.

Account Distribution:

Class Code	*Account*	
1	761-32	70.2%
2	768-11	1.1%
2	768-21	2.9%
2	771-11	.6%
8	354	1.6%
8	355	1.9%
8	359-1	2.2%
9	354	5.7%
9	355	6.0%
9	359-1	7.8%
		100.0%

Job Type 8—Pole Replacement—No Transformers

Includes but not limited to:

Job Description:

(1) Replacing poles.
(2) Installing, removing or transferring service drops.
(3) Relocating or replacing miscellaneous line devices and transferring minor items of pole hardware.

Account Distribution:

Class Code	*Account*	
2	768-11	1.7%
2	768-21	31.8%
2	771-11	3.9%
2	775-49	4.1%
8	354	14.2%
8	355	.1%
8	359-1	.1%
9	354	41.7%
9	355	1.5%
9	359-1	.9%
		100.0%

Class code numbers in the above account distributions are machine designations used to identify charges to the accounts as either operation, maintenance, new construction or removal costs.

To Survive, Industry Must Get Next To People, Iowa Utility Executives Hear At Annual Meeting

Unless we do something about public opinion, our industry will not survive more than two or three generations, PG&E Vice President Robert R. Gros warned some 550 executive representatives of Iowa's investor-owned utilities attending the 13th annual Management Conference in Des Moines, October 14-15. This is our "count down," he declared, and we are no longer at "10" or "9" or "8"; with government now producing one fourth of the electric power in the United States, we are at "7.5."

Some people wince when we refer to Federal Power as "socialism," continued Gros, but all enemies of American business are part and parcel of the same group. Federal power is socialism, he asserted, and there is no such thing as a little bit of socialism any more than there is a little bit of pregnancy. Unfortunately, the great mass of people recognize no evil in Federal power; they should be worried, but they aren't.

The utility industry's record should speak for itself, said Gros, but it doesn't; our public image needs a face lifting. We can turn the tide of public opinion, he concluded, but we've got to get rid of slogans and get next to people . . . tell them what's in it for them . . . and then get rid of the government gravy train. Let's begin by re-selling the incentive system to ourselves.

Leading off an executive panel discussion "Growing with the new Iowa," Duane Arnold, vice president and general manager, Iowa Electric Light and Power Company, urged utility executives to cooperate in every way possible to achieve the fullest development of rural areas. With the number of farms decreasing, he said, we must assist smaller units to meet the challenge of larger commercial units in the market-place. There is a tendency of some to make rural people feel like second-class citizens and to instill in them the conviction that they are dependent upon government, he declared. But, these people are not so helpless that they must be subsidized. They have real strength of character and self respect, and it is the responsibility of utilities to counteract politically-prompted changes of rural attitudes.

About 1000 farmsteads per year are closed down in Iowa, said George Neal, board chairman, Iowa Public Service Company, and, while the land is still cultivated, people have gone elsewhere to earn wages. Utilities can do much to make Iowa an attractive area for new industries so that these people can stay home. Modernized tax laws to encourage investors, and "willing" local financial aid, he said, would help create more payrolls, more jobs, and more prosperity for the state.

Iowa will have to continue to depend upon thermal plants for its electric power needs in the future despite the fact that hydro-electric power is being and will be produced on the upper Missouri, N. Bernard Gussett, board chairman of Iowa Power and Light Company, told conferees. These multi-purpose dams, he said, will provide very little reliable energy except to a few in western Iowa chosen through the quirks of a developing bureaucracy because they are served by municipals or cooperatives. Whatever power may be forthcoming from these sources, he said, will not be available to all citizens of Iowa even though they all helped pay the billions of dollars of cost.

The investor-owned utilities, continued Gussett, have banded together and authorized Sargent & Lundy to make a study recommending expansion over the next 20 years. No stone is being left unturned, he said, to provide the state with adequate, dependable power. This program includes installation of larger generators, made possible by the Iowa Grid, participation in the Pathfinder nuclear project, and research into direct transfer of energy from heat to electricity. In the performance of our duty, Gussett concluded, we will expect to

Iowa utilities' executive panel, consisting of (from left) N. Bernard Gussett, Loren Hickerson (moderator), George Neal, and Duane Arnold, exchanges viewpoints with Sherman Knapp, right, EEI president, between sessions of the Iowa Utilities 13th annual Management Conference.

General Electric's preferred-kva distribution transformer program offers you five important ways to lower your total owning costs of distribution transformers. The preferred-kva concept is based on an extensive survey made among representative utilities across the country. The majority of those interviewed preferred standardizing on these 55° ◎ 65° transformer ratings: 5/5.6, 10/11.2, 25/28, 50/56, 100/112, and 167/187 kva.

By standardizing on these preferred-kva transformer ratings from General Electric, you can own the highest quality transformers at lower total owning cost than ever before possible.

Before you buy another transformer, let your G.E. Sales Engineer show you how you can lower your distribution transformer owning costs with preferred-kva ratings from General Electric.

Lower Inventory Cost You can reduce your transformer inventory costs by standardizing on preferred-kva ratings. For example, if present maximum stock requirements are 20 15-kva units and 35 25-kva units, a total stock of 55 transformers is required. Standardizing solely on the 25-kva rating, total stock could be lowered to 44 units because of the diversity of need.

Simplified Procedures Standardizing on preferred-kva distribution transformer ratings lowers the cost of such overhead items as ordering, record keeping and financial procedures. Simplifying these procedures plus simplification of transformer application methods helps lower your total owning cost of General Electric distribution transformers even further.

Lower Initial Price In addition to the other factors which contribute to lower distribution transformer owning costs, General Electric recently lowered the initial price of preferred-kva transformers as much as five percent.

This action was taken to reflect manufacturing cost savings which result when utilities support this program by volume purchases of fewer kva ratings.

Progress Is Our Most Important Product

GENERAL ELECTRIC

continue to perform as a collector of major taxes from those we serve, hoping that eventually the American people will insist that this burden be equally shared by all who benefit from electricity.

How Public Is Public?

Our industry's whole approach needs a rough, tough going over from kilowatts to customers . . . toward a proper public understanding of the tremendous contribution of shareholder public utilities to the country, Sherman R. Knapp, EEI president, told conferees. We have suffered for years from a massive misunderstanding because people do not know the score or the stakes, he said. Our companies were created to serve the public, they are financed by the public, and they pay dividends to the people who trusted them with their savings, like any other business. How *public* can you get? he asked. Yet, federalized power has usurped our good name as "true" public utilities, and this confusion of words has brought a confusion of ideas in which two-thirds of our customers don't know we are running a business.

Tax inequities are the number-one problem of investor-owned utilities, continued Knapp. Four out of five of us who pay electric bills kick in 23 cents in taxes for every dollar on the bill, he said. We have no quarrel with the idea that the electric bill is a convenient device for collecting taxes to support government, he said, but why should that fifth person not pay his share of costs for government, schools, highways, and missiles? More than half a billion dollars a year slips through this tax loophole. Our customers, who have lost part of their civil rights, can and should demand their right to tax equality, he concluded.

A utility has an unusual incentive to be a good citizen in its own community, said G. C. Rawls, president of Louisiana Power and Light Company. Since it is geographically inflexible, it must be flexible in other ways . . . developing its customers in its own neighborhood . . . accepting new methods, new buying habits, and new processes. People are no longer concerned with just making a living; they are concerned with what kind of a life they can live with the living they make. We have new customers with new ideas that require fast footwork on our part, he said.

Tomorrow we may die natural deaths, continued Rawls, if we do not take advantage of the many new developments. These, he added, such as automation, should not be considered as calamities for employees. History has shown that employment will continue to increase with the application of these new developments, though not necessarily in the same channels.

Most utility stocks are doing very well, said Harold Young, Eastman-Dillon, Union Securities & Co., and as far as we can see ahead they will continue to be counted among the best investments. But this is no time for mutual admiration, he said. Many people avoid utility investments because the industry is regulated, because it faces the government ownership threat, and for a number of other reasons. Utilities must keep the public informed, for a careless word can start a trend toward municipal ownership. A constant job must be done to keep the regulators informed so they will recognize the importance of being able to attract money. And, not the least of things to be done, he said, the public must be constantly reminded of the worthwhileness of the industry's securities. It is also important, he added, to cultivate the financial community and know the people in it personally. Set the pace with good housekeeping and keep your customers informed of the need for adequate rates; keep on top of what people think, personnel problems, and load building. All the world is waiting for the electric dryer, he said; how long is it going to be before you go out and take the order?

Profits are a working man's best friend, said George C. Kennedy, Rockwell-Standard Corp., and while hard-boiled economic facts guide a company toward a general location for a new plant site, factors which must be taken on "faith" rather than measurement often tip the decision toward a specific community. In order to be successful, a new plant must operate in an area where people understand and believe that it is proper to make a profit. All business, he said, is sensitive to and dependent upon proper community attitude.

An area must want industry not merely to create jobs and payrolls and pay taxes, continued Kennedy; but, because its people believe in a society where men are free to work where they please, risk savings, invest hard-earned dollars, plow earnings back, grow, expand, progress, and never stop.

Watch Your Language

If you want people to understand you, said W. M. Longman, Central Surveys Inc., throw out your old vocabulary and use terms and phrases that are self-explanatory. "Public power," "private power," "public ownership" do not convey a precise meaning or contribute to clear understanding, he said. Results of a nation-wide survey indicate that "investor-owned," "government owned" etc., are well-understood terms. Correct public understanding, he said, depends upon a positive approach, presenting the facts in readily understood terms at every opportunity.

Only half the people are convinced that they can rely on electric companies, without government help, to provide future needs, Longman continued. Many think that atomic development is too big and can only be handled by government. Many are still not aware that the government is in the power business. To set the people right, the true story must be told over and over in understandable language.

Technical Manpower Shortage Will Be With Us For Centuries, Weir Tells AIEE Fall General

Technical brainpower continues to grow in importance in modern industrial civilization, resulting in a technical manpower shortage that "will be with us from here on," perhaps for centuries, Professor J. R. Weir, of California Institute of Technology, told a symposium on management planning aspects of future manpower shortages at the Fall General Meeting of the American Institute of Electrical Engineers in Chicago, October 10-14.

"The demand for technical 'know

how' must inevitably increase for many decades, perhaps for centuries to come, probably at a geometric rate," he said. Raising of the standard of living, he said, may possibly be determined by the number and quality of trained technologists available to the nations of the world, and this may determine the rate, "at which the underdeveloped nations can industrialize," he said.

Following are excerpts from some of the more significant technical papers presented:

Generation

A digital computer study of the resynchronizing of a turbo-alternator was described by R. N. Sudan, Cornell University. He concluded that the digital computer is a very useful aid to solving the stability equations of a turbo-alternator including the effects of voltage regulator, governor and the asynchronous power.

Such an analysis checks with the test performance of a 45-mw generator and the relative magnitude of the different components has been brought out. The limit of transient stability can be extended if the generator is allowed to slip a pole pair, he said.

In his paper on remote control of cooling tower fans, R. J. Davis of Black & Veatch said that the electric energy requirements of the larger cooling towers that result from larger steam turbine generator units, are of such magnitude that remote control is used to minimize energy consumption. The larger towers must be located at a greater distance from substations and main plant areas than is required for smaller towers with the result that longer and more expensive control circuits are needed for remote control, he said.

Conventional control system investment costs vary indirectly with circuit length, while supervisory system costs increase very little with circuit length. Therefore, there is an "equal cost" point where a supervisory system should be considered, he said. As circuit lengths increase beyond this point, conventional control costs quickly become excessive.

"With the present trend toward automation in power stations and the application of control computers to accomplish boiler-turbine startup and operation, there may soon be a need to extend this automation to condenser cooling water control. A supervisory system can be applied to accomplish the control and to transmit the data required," he concluded.

A new direct method for deriving loss coefficients (B constants) which locates the equivalent load center and calculates the impedance of a single line from each generator to the equivalent load center with mutuals between all pairs of these lines was presented in a paper by D. R. Hockman, Consumers Power, and A. L. Toalston and D. C. Harker, both of Commonwealth Associates, Inc. The B constants are shown to be simply the resistances of these lines modified by the generator voltages and kvars.

Studies on system economics of peaking generation by R. D. Camburn and O. A. Lentz, both of Commonwealth Associates, Inc. were presented in a cross section of their findings to date. Their findings are summarized thus: (1) There is presently little economic incentive for installing peaking generation, except perhaps pumped storage hydro, on systems in a position to consider the addition of a unit of 150 mw or greater capacity. (2) Where topographical conditions are favorable, pumped storage hydro generation appears to offer appreciable economic advantage for systems that could utilize such a plant of 100 mw or greater capacity. (3) Various types of peaking generation may be economically attractive on systems where the optimum size unit addition is less than 150 mw. (4) Large size, high efficiency, steam turbine-generators are still the most effective way to achieve lowest cost electric power. "Since peaking units do not presently appear economically attractive on large systems, it follows that greater effort should be directed toward developing high-pressure, high-temperature steam generators, turbines and electric generators better adapted to cycling operation," they said.

The effect of unit size, reliability, and system service quality in planning generation expansion was discussed by C. J. Baldwin and C. A. DeSalvo, both of Westinghouse Electric Corp., and H. D. Limmer, Public Service Electric and Gas. They presented results curves for studies of the economic effect of ultimate unit size, boiler arrangement, forced outage failure rate, and system service quality standard. The curves are based on a range of first costs believed applicable in the Public Service area.

In general, based on the estimates and assumptions used, the study indicated quantitively the following: (1) Large units are economical regardless of which reasonable cost structures are assumed. Patterns with ultimate sizes of about 1000 mw—about 10 percent of the PS system—were optimum for assumed interconnection policies. (2) PS transmission costs prevent even larger units from being more economical. (3) Single-boiler units are more economical than units with twin boilers. (4) Doubling average forced outage up-time is worth about $2.20/kv on the unit first cost, while $11.70/kw could be paid to avoid halving it from normal value. (5) Unduly restrictive quality of service standards can be quite expensive, while moderate sums will improve poor service to a quite acceptable level.

Scheduling of hydro and thermal plants, through use of co-ordination equations, does provide optimum economy, given smoothed input-output curves, and avoiding inequality constraints, that is, 'end point' operation, according to a paper by P. L. Dandeno, Ontario Hydro. He said that on a computational basis, compliance with these limitations has proven difficult.

He described the computational experience obtained in Ontario Hydro during the past several years with solutions of the hydro-thermal co-ordination equations. These equations describe the manner in which hydro and thermal stations should be scheduled over a given period of time where the load demand is known; the total and incremental losses can be calculated; the hydro stations use the prescribed amount of water available and no more, and the thermal stations operate most economically—that is, their fuel consumption over the same period of time is a minimum. Potential economies have

At the recloser-vs-oil circuit breaker session, the following men (from left) presented their companies' practices and answered questions from the floor. They are R. B. Bailey, Southern Services, D. W. Gant, Commonwealth Edison; L. Morton, Union Electric; Leonard Olmsted, Electrical World; B. Flugum, Westinghouse Electric; R. W. Jenkins, Baltimore Gas & Electric; and W. L. Carey, Portland General Electric.

been estimated by comparing actual and calculated loading schedules for five selected days.

"The application of probability methods to generating capacity problems has reached a stage where it should be accepted as a normal tool of the system planner; but that does not imply that all problems have been solved," said the AIEE Working Group of the AIEE Subcommittee on Application of Probability Methods. Their paper compared several measures of reliability in their application to a single problem.

Reclosers vs OCB's

Relative values and benefits of reclosers and oil circuit breakers were analyzed in an exploratory symposium conducted by L. M. Olmsted, Electrical World. Members of the symposium included R. B. Bailey, Southern Services; D. W. Gant, Commonwealth Edison; L. Marten, Union Electric; B. Flugum, Westinghouse; R. W. Jenkins, Baltimore Gas and Electric; and W. L. Carey, Portland General Electric.

Reclosers and breakers were taken through the gamuts of cost, flexibility, maintenance, operation, and interrupting ratings. Experiences with both were related:

R. B. Bailey said, "Reclosers have proven reliable when used as the protective device on distribution substation feeders. More extensive use of reclosers is anticipated as long as present price differentials between reclosers and oil circuit breakers exist."

D. W. Gant said, "The advantages of oil circuit reclosers over conventional oil circuit breakers and relays included substantial savings in installed costs and increased protection against transient faults, with a resultant reduction in customer outages and lower operating expenses. The anticipated increases in recloser ratings and new features should further widen the present field of recloser applicability."

Speaking from the floor, Jim Smith, General Electric warned that in a cost comparison between reclosers and OCB's, that when an installed cost difference is arrived at, it is important to distinguish between 4 kv and 12 kv. "At 12 kv you are comparing 15 kv class equipment. At 4 kv you are comparing 4 kv with 15 kv class breaker cost.

"Your actual savings with the recloser have dollar magnitude, but keep them in perspective when you look at how the rest of the system cost is affected by their installation. The cost of the feeder itself is more significant than the cost of protective devices," he said. "If the size of substation is small enough, then reclosers should be considered, but don't let this substation change because of the reclosers. These are not tails to wag the dog," he warned.

Mr. Flugum said there is inherent danger in putting cost on a $/kva basis. "We must consider total cost magnitude and savings in deferred investment," he said.

On the question of how much companies adhere to standards, some of the following comments were observed:

Mr. Bailey said his company adheres to the derating factor—Class 2 duty cycle runs 85 to 90 percent of the breaker rating, while Mr. Gant said his company took the derating factor into consideration. Mr. Carey's company does the same—derating at about 10 percent. Mr. Jenkins' company tries to make applications in line with the standards.

While flexibility was taken as one of the advantages the oil circuit breaker has over the recloser, some of the panel members believed that this flexibility was not always necessary. As Mr. Gant said, with the relay and OCB you get a variety of TC settings, but maybe this is a sort of hindrance. The ideal situation is when the setting of the protecting device is made to the capability of the feeder—you do this with the recloser. Mr. Carey said PGE didn't need the flexibility because the feeder breaker in the substation has to many times coordinate with the high side fuse and the low side fuse.

Protection

There is a need for economically extending the benefits associated with a microwave protective system to shorter line lengths, particularly cable circuits, and also into areas where terrain or city congestion precludes satisfactory microwave terminals locations, stated J. R. Linders, Cleveland Electric Illuminating. He described how coaxial cable can fill this need. A coaxial cable can transmit a band of frequencies comparable to those which are multiplexed on a microwave carrier. The technique of multiplexing onto the coaxial cable utilizes the same components as are used for multiplexing onto the microwave carrier. Thus the rela-

tive cost of a coaxial cable and a microwave link will depend primarily on the installed cost of the cable as compared to the installed cost of the high frequency components of the microwave link, he said.

The reliability and security of pilot-wire relaying can be improved by the following: (1) The use of fault detectors to supervise conventional a-c pilot-wire relay tripping, where their use will not compromise the relay system performance. (2) Supervision of the receiver-relay contact of the transferred-tripping schemes by fault detectors, and (3) Channel-failure supervision of the trip circuit with blocking schemes, according to a paper by H. W. Lensner, Westinghouse Electric Corp.

In presenting a wide variety of pilot wire relaying systems, he said that experience has indicated that well-designed private wire circuits are likely to be more reliable than leased circuits.

Methods of distribution circuit protection at Idaho Power were presented by M. E. Byrne and J. N. Haroian, both of that company. Their protection plan is broken down functionally into control, protection and feeder performance data.

The recent feeder control and protection scheme evaluation is listed as follows: (1) 48 percent of faults cleared after first reclose; 35 percent after second reclose; 4 percent cleared after third reclose, and 13 percent of faults were permanent faults and the feeder locked out.

"The above evaluation has focused our attention to decreasing the number of successful second reclosers. To date, 87 percent of the feeder faults are transient faults of which only 55 percent were cleared after the first reclose. It is difficult to attribute the large number of second successful reclosures to multiple lightning strokes and, as such, improvement in feeder performance is expected by delaying the immediate reclose," they said.

To meet reclosing requirements of a ring bus, L. A. Davidson and V. M. Hines of Oklahoma Gas & Electric designed and built a reclosing relay with positive control of the operating sequence. It consists of an assembly of 17 standard telephone-type relays and one five-level, 25-point rotary stepping switch, constructed for operation with a 24 or 60 cell battery. It features timing, selective interlocking and checking, selective quick reset, flexibility and positive antipump.

If the line fault is persistent, the line air-break switch is opened, isolating the line, the circuit breakers are closed, and the bus section is restored to normal. If the ring bus section is faulted, the device locks out, with the circuit breakers and air-break switch open. Sequential operation of circuit breakers and air break switch is positively assured under all conditions, in a minimum of time. Accurate timing is assured with flexibility of adjustment.

Surge impedance analogue studies of lines and stations are applicable to a wide range of power system surge performance problems, according to H. R. Armstrong and B. D. Miller, both of Detroit Edison. It is conceivable that a building block type of analogue could be constructed with plug-in units designed to represent circuit elements such as a single station bay, a line entrance, or an entire bus section.

"Regardless of how the analogue may be constructed, the method offers a low-cost reasonably simple method to obtain surge performance data on complex circuits that otherwise could only be approximated," they said.

T. F. Watson and R. Hiatt, both of Commonwealth Associates, Inc., discussed line entrance gaps for protection of substation insulation. Experience accumulated over 35 years seems to justify the following conclusions: (1) With proper design and use of suitable margins between gap sparkover and insulation withstand values, gaps represent an acceptable low cost method for protecting station insulation not adequately covered by transformer lightning arresters. (2) Suitable gap settings can be selected for most situations which give reasonable protection against impulse voltages and freedom from excessive trip-outs from switching surges. (3) When properly applied, the use of line entrance gaps for supplemental protection of substation components has not resulted in excessive trip-outs of lines due to unnecessary gap operations, and (4) Installed costs for entrance gap installations are about 20 percent of the cost of comparable arrester installations in the same voltage class.

"As transformers continue to become of larger capacity and of higher voltages, it is imperative to retain, if not to improve, the sensitivity of the fault detection system," said L. C. Aicher, Allis-Chalmers Mfg. Co. "To achieve this, when using the ground current technique with power class transformers," he concluded that: (1) It is undesirable to use additional capacitance in parallel with the resistive shunt for it may completely mask evidence of failure. (2) Increasing the resistance in series with the winding under test reduces the sensitivity of the ground current system as a fault detector. This includes resistance used to raise shorter than 40 microsecond wave tails. (3) Practical ground current records can be made by permitting the initial capacitance current spike to traverse off screen for the brief instant of its duration.

So that system grounding may be described on a common basis that will be universally understood, G. D. Breuer, General Electric Co., presented a proposal to use the concept of the coefficient of system grounding in AIEE standards. His definition was stated as follows:

"The coefficient of system grounding at a selected location of a three-phase system and for a given system layout, is the ratio, expressed as a percentage, of the highest rms line-to-ground power-frequency voltage that may appear on a sound phase at the selected location during a phase-to-ground fault, to the line-to-line rms power-frequency voltage which would be obtained at the same location with the fault removed."

Construction

C. S. Bucholz, General Electric Co. described that design and testing of precast concrete guy anchor slugs at G.E.'s Hanford Works in Washington. Tests were conducted in medium sand. From the tests—begun in 1954—came knowledge that permitted replacement of wood dead

man anchors—which were decaying—with concrete anchors.

About 1000 concrete cone anchors have been installed at Hanford over the past seven years, both on replacement and in connection with new pole line construction. It is believed that most of the remaining 4300 log anchors will require replacement within the next ten years. About 150 concrete anchors have been used for overhead steam line and other non-electrical structure guying applications. Said Mr. Bucholz, "The use of these anchors in lieu of other types has saved, and will save, many thousands of dollars in labor, equipment and material costs. There has been no known failure of a properly installed concrete anchor.

"Six Hanford standards for guying have been developed based on the tests described. In 1959, an estimated savings of $7500 in engineering and drafting time alone was attributed to the use of these standards," he said.

Costs of tower foundations for transmission lines over lakes often will be more than 50 percent of the entire cost of construction, in contrast to 15 to 25 percent of normal lines, concluded A. V. Price, Ebasco Services, Inc.

Transmission

Decoupling of transmission lines to radio influence voltages was discussed by S. B. Griscom, D. F. Shankle, and E. R. Taylor, Jr., all of Westinghouse Electric Corp., and R. H. Schlomann, American Electric Power Service Corp.

The authors said that the R-C decoupling network has been shown theoretically to provide both better attenuation and impedance matching characteristics. Reactive elements alone (L-C) may give sufficient attenuation, but their low-loss characteristic is apt to alter the RI performance of the source side, by returning part of the energy of the impinging pulses while passing others so that pulse fronts, tails, and amplitudes are transformed.

The paper describes two sets of field tests made to determine whether several sections of the transmission line could be satisfactorily decoupled or isolated to RI using the R-C decoupler network with the resistance shunted, for 60 cps purposes, by a relatively high inductance. While such questions as regard correct line termination and line attenuation at the higher frequencies have not been answered, the use of properly designed RI "filters" or decouplers has been shown to provide a high degree of RI isolation between sections of line.

The tests were intentionally made on a single phase line with no ground wire. Extensive field investigations would involve three-phase conductors plus one or two ground wires. These conductors must all be decoupled to get proper results during simultaneous testing of different line sections, the authors said.

The effect of bundle conductor field influence on EHV transmission line design was analyzed by R. W. Harmon, The Ohio Brass Co. He concluded that 345-kv twin-conductor suspension assemblies without control rings may be sufficiently corona free for operation on some systems, but that 460-kv twin-conductor suspension assemblies will probably require control rings.

"The insulators, particularly with three and four-conductor bundles, should be coupled as low as possible with respect to the conductor system to improve the insulator RIV characteristics," he said. "Prototype suspension assemblies using the low-coupling principle have been laboratory tested to demonstrate that control rings can be eliminated at voltages to at least 650 kv. These assemblies operate at 650 kv with less RIV than existing 345-kv suspension assemblies," he said. Very substantial economic savings can be realized through use of short-coupled suspension assemblies, if right-of-way widths are reduced and smaller towers are designed for the special suspension assemblies.

"There is no foreseeable upper limit on transmission voltages using conventional cap and pin suspension insulators," he said.

Progress in Marketing Organization . . .

The Electrical League Movement Grows, But, Is It Good Enough, Fast Enough?

The Electrical League Movement is a good one, but . . .

The subject of one speaker's message at the 25th annual conference of the International Association of Electrical Leagues, this provocative challenge was echoed a number of times in specific references to electrical industry marketing problems identified by other IAEL conference speakers.

The IAEL president, Clifford C. Simpson, warned that the rate of growth of this association "has been entirely too small." He reported that today there are 60 electrical leagues, declaring that there should be 100.

"Whose job is it to organize these additional leagues? It's our job, yours and mine. And we are doing a poor job, he said."

Mr. Simpson expressed the view that IAEL, in recent years, has barely been holding its own, as the number of members is concerned, and in exerting its full influence throughout the industry.

He declared: "We need more aggressive leadership in expanding our movement, in encouraging and showing the way, to more of our members, as to how to operate a more aggressive effort in their respective market areas."

H. C. Moses, Jr., vice-president of the Thomas & Betts Company and past president, Electric Association of Chicago, Illinois, noted that as a selling operation, the electrical league's job is to form a powerful sales team. He recommended this approach:

"First, we have to sell each other on this coordinated idea. We must sell the utility on joining and using the rest of the electrical industry—who, for the most part, are most anxious to get into this fray and help build load by performing their own functions at their own level.

"Then, we must sell the electrical industry on helping and following the utility lead. After all, the utility is our major stockholder in each electrical league. They are the biggest beneficiaries. They are the most

immediate beneficiaries. But, they will work in a vacuum if the rest of the industry isn't sold on helping and following intelligent leadership.

"And, we must sell the whole team—that any and every effort is of benefit to all—that electrical interdependence is a fact. Having thus formed the powerful sales team, then it is our job—as a team—to sell in every possible way the benefits of using electricity."

Dickman Reports On IEC

IAEL conference speakers reported on successful projects now being carried out. For example, Fred F. Dickman, manager of industrial sales for the West Penn Power Co. told of results from activities of the Industrial Electrification Council. Among these is the presentation of the Metal Sheath Electric Heater Course, the six-lesson training course for industrial customers which was developed in 1953 by West Penn Power Co. Noting that, to date, 52 utilities all over the nation have purchased 58 courses and presented it to over 14,000 industrial customers, he said:

"Think of the impact on the sale of electric heating elements and associated wiring and controls and when we have stimulated 14,000 employees of our customers to be searching for ways to use electric heat in their plants, when we have created 14,000 new salesmen for our wares. We know this happens because we have witnessed it among our own customers. With this course, the Council has made a tremendous contribution to the promotion and acceptance of electric heat in industry. And the number of utilities who have used the course continues to grow."

He reported that the Council had recently completed the preparation of an Industrial Electric Power Distribution Course, "which is the best tool yet developed to promote adequate industrial wiring," and that it has already been presented to some 463 people in the area representing most of the sizeable industrial customers and contractors, "who will probably use the standards of this course when they design or specify wiring."

Mr. Dickmann noted that NEMA applied for membership in IEC on an equal basis with EEI. The details of this arrangement are now being worked out whereby NEMA will represent its member manufacturers in the same manner that EEI represents its member utilities. (Editor's note: As of January 1, 1951, the IEC is to be co-sponsored by EEI and NEMA.)

He also observed that the value of the Council is demonstrated by the support which the manufacturers have given it. From the three who originally joined with EEI, the number has grown to 55 who back the activity with financial support. Now that both NEMA and NECA have joined the cause, he predicted that the support these three organizations will provide will give even greater impetus to the Council to expand its usefulness.

Although so far this program has had little impact on Electric Leagues, Mr. Dickmann acknowledged, the expanding activities of the Council will provide more opportunities for the league to serve their industries with promotional and educational programs.

NEMA's managing director, Joseph Miller, listed these major problems requiring attention in the electrical industry:

1. How to get to our own members with our own plans; 2. Making sure that the electrical industry *does* keep pace with the nation's overall economic growth; 3. Declining corporate profits ("services" are increasing faster than "goods," and we are part of "goods"); and 4. The impact of increasing imports of foreign equipment.

Mr. Miller indicated that NEMA is working on solutions to these problems and developing an expanding organization in an effort to increase the effectiveness of the Association's work.

G. T. Bogard, manager of Residential Market Development, General Electric Company, said "Electric Leagues only exist to integrate the marketing efforts and promote the business welfare of its members. Is there any program, any promotion, which can benefit more members of your league organizations than selling the package, the whole electrical system contained in a total-electric Gold Medallion Home?" he asked.

"I think not," said Mr. Bogard, "and I expected no challenge . . . because this audience is fully aware that electric heat is on the move, EEI has a powerful $2½-million annual program under way, and Westinghouse and General Electric are each spending that much and more to promote total-electric Gold Medallion Homes. It is impossible for me to put a figure on the contributions of other manufacturers, but it is certainly substantial. Locally, the utilities are spending far more than this combined."

But, the GE executive pointed up a problem, too. He declared: "There is a dire need for standardizing and establishing minimum levels for utility Medallion Home

Leading figures in Electrical League activities compare notes at the recent annual meeting of the IAEL in Kansas City, with R. K. Zimmerman, vice-president of Kansas City P. & L. Co. (second from right) as host. From left, others are: NEMA's Managing Director Joseph F. Miller, PCEA's Managing Director Vic Hartley, and C. C. Simpson, managing director of the Electrical Association of Chicago, and retiring president of the International Association of Electrical Leagues.

K. M. La Rue, gen. sales mgr. of the Kansas Gas & Elect. Co., and Geo. T. Bogard, mgr. of General Electric's residential market development operations, also addressed the IAEL.

Requirements. The lack of any floor under Medallion Home Requirements, if continued, will soon undermine the best promotional program the industry has ever hit upon. If there are any doubts in your mind that this can happen—just remember the sad plight of the electric water heater: Little or no standardization on wattage or tank size, little profit to anyone in the business and—NO growth.

"Let's hope the industry resolves the matter of Medallion Home Standards promptly," challenged Mr. Bogard.

Mr. Wm. D. Renner, vice-president of Howard W. Sams & Co. of Indianapolis, posed these questions:

"In the future, which direction will the customer take, if the source of his procurement and maintenance problems lies in the electronic field? Will he go to the electrical distributor who doesn't understand them, or is he more likely to go to the industrial electronic jobber who has been dealing with these mysterious devices for years and who can serve him with both parts and information to help solve his problems? Wouldn't it be simpler for the industrial electronic jobber to stock the items of electrical hardware because we understand switches, relays and wire? Can the electrical distributor stock and sell the literally thousands of different items of electronic hardware?

"It is becoming more apparent every day that conditions are changing, that the customer is going to go where he gets the parts, service, and information he needs. If the electrical distributor doesn't serve this end, our new, rather alert electronic distributing organizations will fill the need," he predicted.

EEI Pres. Sherman Knapp and American Elect. Power Co.'s John H. K. Shannahan, LBE planning committee chairman, were speakers at the IAEL conference.

13-KV VS. 4-KV . . .

(Continued from page 45)

transmission and substation as well as distribution facilities. For example, in two instances, we have had 13-kv primary circuits extended over 100 circuit miles, carrying over 10,000 kva in load, for short periods of time to meet unusual conditions.

3. Higher load factors on 13-kv circuits result because of the greater area coverage permitted with 13 kv.
4. The problem of motor inrush, which is often a limitation at 4 kv, becomes a less significant problem at 13 kv, eliminating annoying flicker problems and in some cases saving industrial customers the investment in reduced-voltage starting equipment required for motors supplied by 4-kv systems.

E. Appearance

Appearance is becoming increasingly important today in our effort to hold down costs by retaining overhead facilities, thus avoiding underground construction at high cost in areas where load density does not warrant it. A 13-kv system offers several advantages in this respect.

1. A single 13-kv circuit is better appearing than the double or triple crossarm construction which frequently is necessary at 4 kv to supply the load. (See Figs. 2 and 3).
2. The use of single-phase ridge-pin construction at 13 kv in place of crossarm construction at 4 kv is very desirable on rear lot lines.

Evaluation Results

Since economic studies and careful weighing of the practical aspects indicate there is no "rule of thumb" method even for specific areas within our own service territory, it is readily apparent that a simple method of application cannot be offered at this time. However, the resultant effect to date of an evaluation of all the factors involved in the 13-kv versus 4-kv distribution system comparisons by our company are apparent by comparing Figs. 1 and 4. At present, 13 kv supplies 60 percent of the distribution load with most of the remaining 40 percent supplied by 4 kv. The two-phase and three-phase 2.4-kv areas have been drastically reduced and when necessary will disappear. In our Eastern Suffolk area, a small trial installation of 23 kv has been in operation for approximately 16 months.

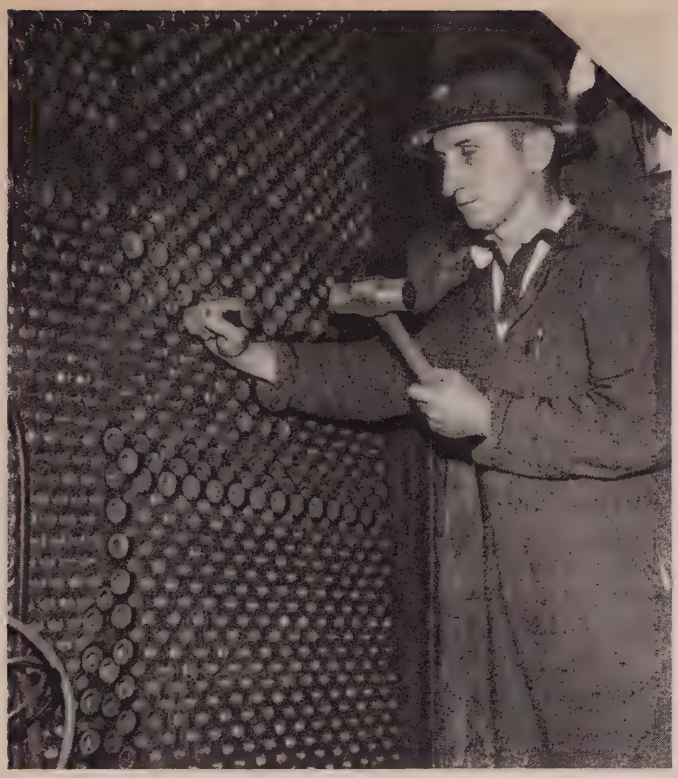
Conclusion

While area economic studies are a major factor in determining the advisability of 13-kv conversion, there are, beyond the classical economic approach, many practical aspects including those discussed here. These must be considered since they can definitely uncover other economic factors not normally considered and also affect the relationship between a utility and the general public.

Our operating experience, verified once again by a recent machine-analysis of interruption records, indicated 13-kv primary distribution has equaled the performance of 4 kv. This can be attributed generally to greater conductor spacing, improved tree clearance and simplified construction. Fast substation breaker operation coupled with proper fuse coordination and the use of properly selected sectionalizing points also contribute much to this successful performance.

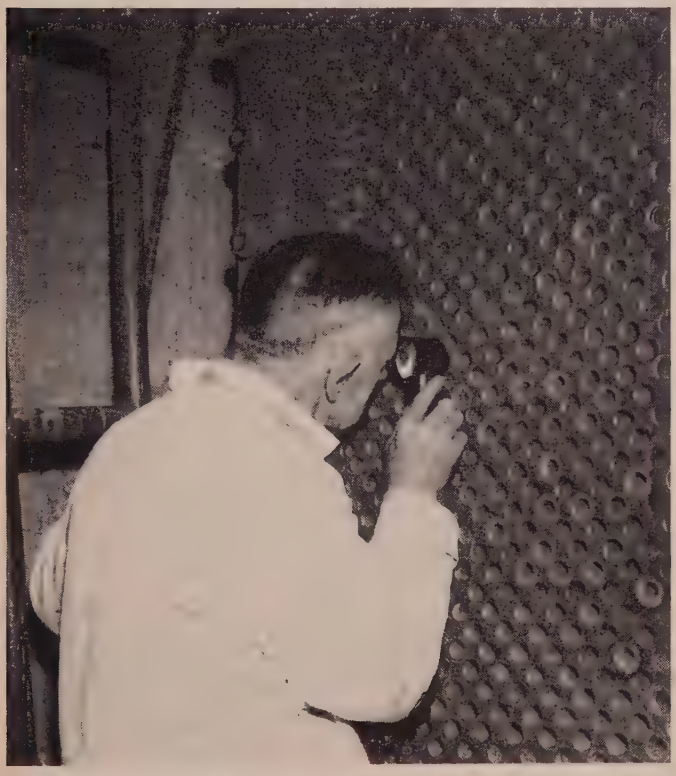
It is also important to note that our linemen prefer 13-kv hotstick work over 4-kv glove work. We have had no accidents in handling conductors on 13 kv. This, we believe, is due to the inherent safety associated with greater working clearances and the step-by-step method of work on 13 kv.

Trial areas of 23 kv and studies under way of 35 kv together with the persistent industry trend toward higher voltages with improvements in the art may lay the groundwork for the distribution voltages for the loads of tomorrow.



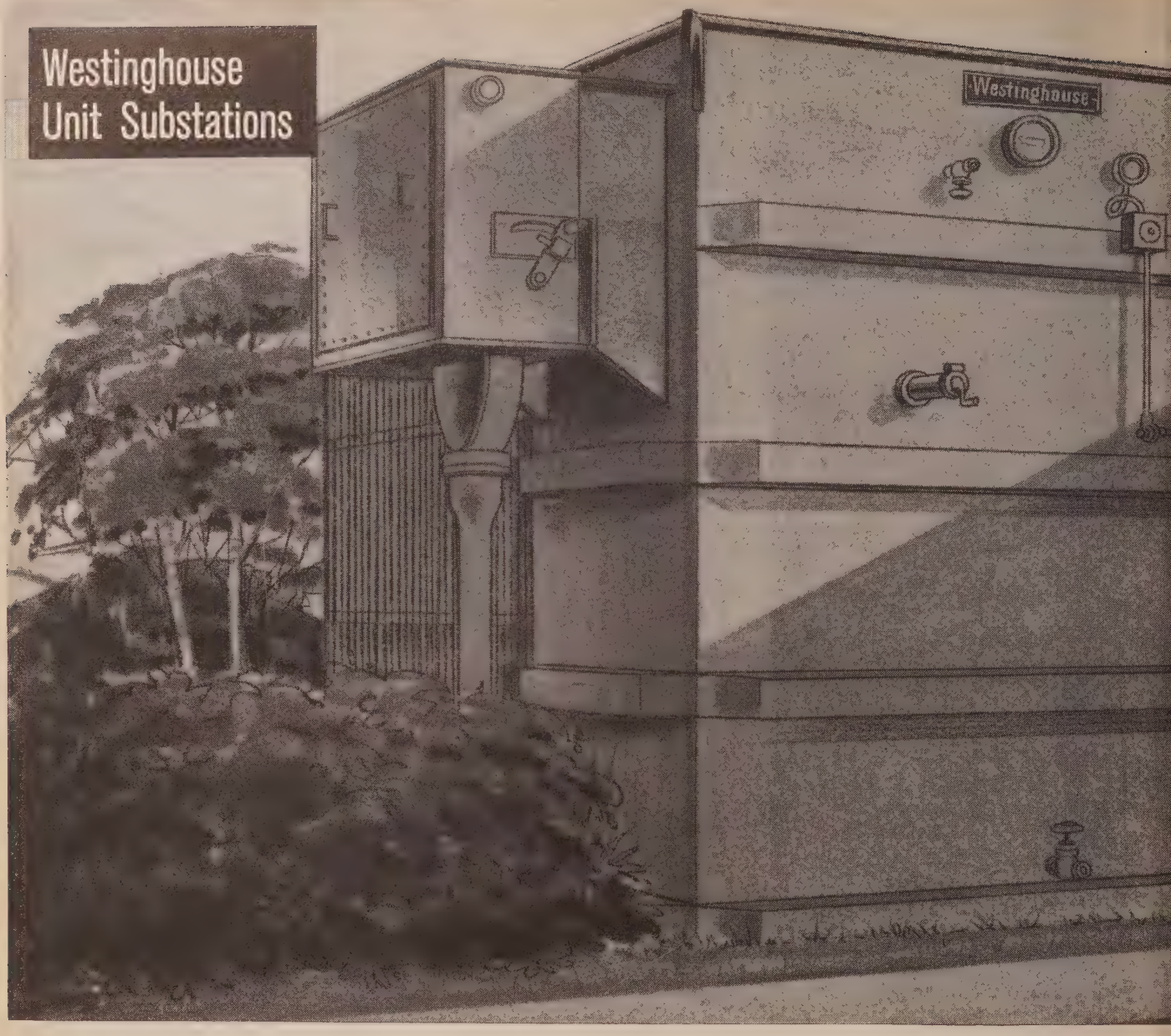
In first step, tubes are installed in the main condenser and flared prior to welding operation. Careful attention is paid to keeping tube joints clean at all times.

Tubes are welded securely to tube sheet with special type gun. Average operator makes a completely tight weld in less than thirty seconds for each tube.



Individual tube welds are carefully inspected with magnifying glass. Incomplete or unsound welds are corrected by re-welding.

Additional inspection test consists of painting soap bubble solution on tube sheet. When main condenser is placed under 5 psi air pressure, leaks are readily detected.



ATTRACTIVE APPEARANCE . . . SUPERIOR PERFORMANCE

With Westinghouse unit substations, you always get ace-high performance. Switchgear and transformer are engineered as a unit—to work together for reliable, trouble-free service.

In addition, these quiet substations are good looking. Adaptable to small land plots, they are "good neighbors" in residential, commercial and industrial areas. Safe, too. Metal-enclosed construction keeps out unauthorized personnel, protects against external hazards.

Installation is simple. Westinghouse unit substations are factory-coordinated, eliminating installation complications. They are shipped in sections . . . require only bolting together and connection of incoming and outgoing lines.

Call your nearest Westinghouse representative for all the facts . . . or write Westinghouse Electric Corporation, P.O. Box 868, Pittsburgh 30, Pa. You can be sure . . . if it's Westinghouse.

Westinghouse

50% Space Savings Effected

A-C Introduces New Control Concept

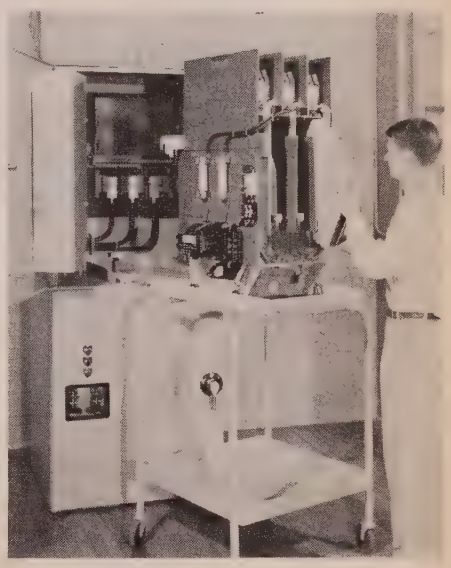
A "dramatic" change in high voltage control design just announced by Allis-Chalmers is considered a breakthrough which the manufacturer calls "the first major innovation in a decade." Allis-Chalmers has incorporated its new Type 456 contactor in a "Space-Maker" control concept offering a significant 50-percent reduction in space.

Electric utility applications for the new high voltage control equipment are promising particularly for station auxiliaries, such as coal handling, ventilating fans and gas blowers. However, significance to the utility industry is probably greater in terms of the possibilities for increased electric power utilization in general industry.

With this newly introduced development, Allis-Chalmers bids for a continuing leadership in a field where its "current products are considered the standard of the industry." Also, A-C expects not only to implement the growing trend to high voltage in control applications but to give further impetus to a market growth rate (for high voltage control equipment) that the company estimates to be more than double the load growth rate for general industrial power. (A-C's manager of control sales, Bob C. Bown, observes, "We like to think that this is due in no small way to progressive thinking and design on the part of the manufacturers of high voltage motor control equipment.")

Allis-Chalmers spokesmen express expectations of being about two years ahead of their competition with the new model contactor, first shipments of which will be made beginning about March of 1961. Prices for the new designs are expected to be "no higher" than current model prices. First public showing of the new equipment was scheduled for the West Coast—the first time Allis-Chalmers has introduced a new development there.

Allis-Chalmers describes its "Space-Maker" concept as: (1) the first starter in the 2000-5000 volt range to employ a two-high design; (2) the first completely drawout control on the market in this voltage class; and (3) the lightest weight controller—about ½ the weight of present designs.



Inspection is facilitated with easily removed barriers and arc chutes.

The key to size reduction in the new design is new and better materials, according to A-C. The Type 456 contactor is the first in the industry to use the new glass polyester "Super Pyro-Shield" insulations. All insulation in contact with high voltage current-carrying parts is flame-retardant and track resistant. "Super Pyro-Shield" insulation replaces sheet metal wherever possible. The new polyester's superior insulating characteristics not only allow for reduction in space requirements, but also extend the life of the equipment many times over, Allis-Chalmers engineers indicate.

Faster and easier inspection was another important goal obtained by A-C in the new design contactor, the company reports. No special tools are required. Arc chutes and barriers are lifted out easily. Pole pieces are rotatable to expose the complete contact structure of all

(Continued on page 80)

Total Capacity To Surpass Grand Coulee

Install First Niagara Plant Hydro Generators

Installation of the first of 13 150,000-kw waterwheel generators has begun at the Niagara Generating Plant.

The units, built for the New York State Power Authority, are the most powerful of their type ever manufactured in the United States.

Combined output of the 13 generators will be 1,950,000-kw. With an additional 240,000-kw from the nearby Reservoir Pump-Generating Plant, the Niagara Project will have a total installed capacity of 2,190,000-kw, surpassing by 216,000-kw the capacity of Grand Coulee, currently the largest hydroelectric power source in the western world.

The generators will generate power at 13.8-kv. This power will in turn be stepped up to 115-kv, 230-kv, or 340-kv to meet transmission requirements.

First power is scheduled to be produced less than three years from the start of construction.

The project is being built on an accelerated schedule because of a major power shortage in the area, due primarily to the partial destruction of the Schoellkopf power station by a rockslide in 1956.

Develop Device to Measure Ultra-Low Pressures

A new laboratory tool capable of measuring pressures less than one-thousandth of one-billionth of atmospheric pressure at the earth's surface has been developed by Westinghouse scientists as part of the AEC sponsored Project Sherwood.

The instrument will be useful in a variety of key ultra-high vacuum research experiments, being ideally suited to low-pressure studies of hot filament-gas interactions such as those encountered in the ordinary fluorescent lamp, in electronic tubes and in thermionic converters.

The device, known as a photomultiplier ion gauge, was developed by W. J. Lange, Henry Riemersma and R. E. Fox, research physicists working on part of the ultra-high vacuum research program.

The new pressure measuring device utilizes a beam of ultra-violet light to produce the required ionization of gases in a vacuum, instead of the customary technique of boiling electrons off the surface of a hot tungsten filament and in contact with the gas being measured.

The light is beamed onto a metal surface which has the ability to release electrons under ultra-violet stimulus. These electrons are guided onto a series of similar surfaces which multiply the electrons in speed and number. These electrons then are used to form the ions that are collected and counted in the usual fashion.

IBM Introduces Optical Scanner

IBM has introduced an electronic optical scanning device that can read directly into a computer memory for high-speed data processing. The new solid-state unit reads data printed in widely-used type styles on various paper or card documents, at a rate of 480 characters per second. As many as 400 documents per minute can be read.

The printed data is automatically translated into machine language for direct input to an IMB 1401 computer. The unit can handle documents of various sizes and thicknesses, with a maximum height of 3⅔ in.

GE Reports Customer Accepted of Preferred Design Concept

More than 60 percent of General Electric's 1960 power transformer orders to date have been for the company's Preferred Design units, according to an announcement by the Power Transformer department.

The Preferred Design program was announced by the company last year as a revolutionary concept in the design and manufacture of large power transformers rated as high as 250,000 kva, 230 kv. Purpose of the program was to help fight inflation by reducing manufacturing costs through adopting uniform mechanical features which permit mechanized production line techniques.

While utility cooperation and acceptance of Preferred Design transformers has been high, according to G. A. Hoyt, department general manager, GE personnel are meeting with customers to iron out application and other problems.

A-C Introduces (Cont'd)

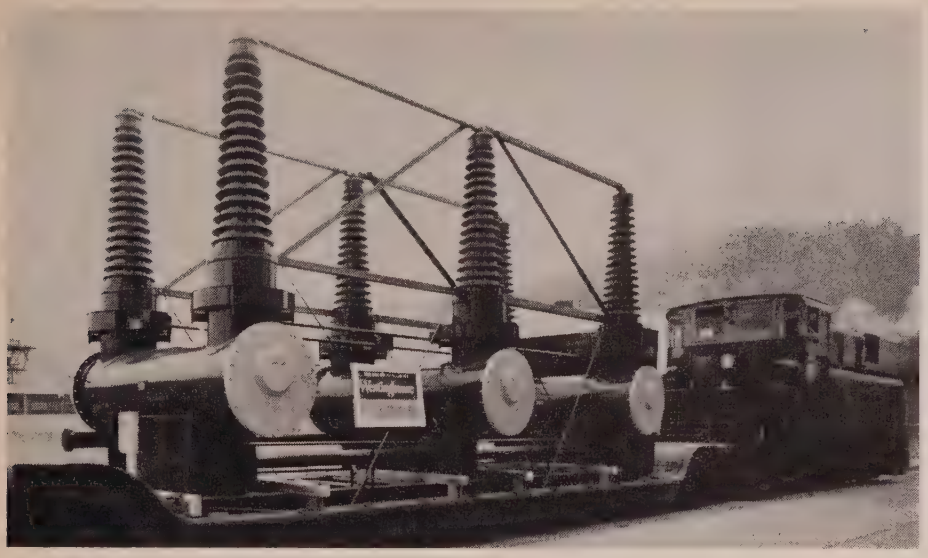
three phases without any obstruction. Coils, too, can be changed quickly by removing one bolt and the coil connections.

The simplified mechanical design has a vertical stroke and double-break contacts with new floating guides for trouble-free operation. Use of a clapper type magnet eliminates the usual problems associated with large solenoid magnets.

Dimensions of the "Space-Maker" contactor are 24-in. deep, 16-in. wide, and 28-in. high. (Previous contactors measured 15-in. wide, 25-in. deep, and 43-in. high with fuses mounted separately.)

The "Space-Maker" contactor has passed all AIEE and NEMA standard tests. All components were separately tested to provide individual ratings and mechanical strength. In addition, the complete control unit was tested to meet the following ratings: 1. 60-kv impulse level; 2. ability to withstand mechanical stresses of rated short-circuit of 50 mva; 3. 15-kv, 60 cycle test for one minute; 4. continuous current rating of 400 amp.

Ship 230-kv SF_6 Breaker To PP&L



230 kv SF_6 Breaker was shipped to PP&L fully assembled.

A 230-kv, 15,000 mva circuit breaker, the largest ever to be transported fully assembled, with bushings in place, has been shipped to Pennsylvania Power & Light Co.

The 230-kv breaker was also the first unit of its size ordered which specified SF_6 (sulfur hexafluoride) as the interrupting medium.

PP&L will install the breaker at the new Brunner Island steam-electric generating plant as one of two (the other a conventional oil-filled circuit breaker) protesting 45 miles of 230 kv transmission circuits.

With continuous capacity of 1600 amps at 230 kv, the breaker has dead tank construction mounted on common base beams, positive mechanical connections between all contacts and operating mechanisms and bushing-type current transformers.

Survey Reveals Home Laundry Changes

A survey completed of homemakers' needs in home laundry equipment has revealed two decided changes: (1) about half of the home laundries are out of their former basement locations, and (2) more and larger loads are being washed every week.

The first significant trend noted was the number of home laundries that are no longer housed in the basement. About 50 percent of the automatic washers now in use are being used on the first floor, in the utility room, kitchen or other living areas.

The second important fact observed was that users are nowsurveyed. washing more loads per week, with more clothes per load. In 1952, the average week's wash was approximately 39 pounds. By late 1958 the average weekly wash had soared to 65 pounds. At the same time load size increased over the same period from approximately six pounds per wash to more than eight pounds per load. Almost 27 percent of all wash loads are less than 10 pounds in weight.

The survey, completed by General Electric, covered 1,100 families. Characteristics of 8,800 wash loads of 70,000 pounds of washing were

Schedule Computer Control For French Power Plant

Electricite de France will construct the first large steam power plant outside the United States employing integrated automation. The plant, to be built at St. Ouen, France, will be controlled by two Thompson Ramo Wooldridge RW-300 digital computers.

Electricite de France, owned by the French government, has made great investment in automatic control. Two computers are in operation at the first unit of its commercial nuclear power plant at Chinon and two more will be installed at the second unit in 1961. These systems are used to detect ruptures in reactor fuel cases.

Electrical Insulation Conference Begins Dec. 5

The latest information on all forms of electrical insulation will be presented in the Third National Conference on the Application of Electrical Insulation, scheduled for the Hilton Hotel in Chicago Dec. 5-8. The Conference is under the joint sponsorship of AIEE and NEMA.

More than 2000 are expected to participate in the program, which has been planned for the broad interests of designers, marketers and users of electrical devices. Eighteen technical sessions will deal with specific areas of insulation application. "End user" presentations will be made as part of a number of these technical sessions; typical of these are papers on switchgear insulation and on transformer insulation, by W. K. Anderson of Commonwealth Edison and A. S. Mickley of Philadelphia Elect. Co., respectively.

Recognition for eminence in science and engineering will be given to Dr. Mervin J. Kelly, former director of research and retired board chairman of Bell Laboratories, who is to receive the annual "Golden Omega" award of the Conference. The award presentation, as well as the principal address at the "Unity of Action" banquet on Dec. 6, will be made by Walker Cisler, president of Detroit Edison.

Registration for the Conference can be arranged with A. J. Wiltjer, Union Carbide Corp., 230 N. Mich., Chicago 1, Ill. The fee for complete Conference participation (not including meals) is $15. A commercial exhibit is a part of the Conference, and industrial tours are being scheduled at Allis-Chalmers, Western Elect., GMC's Electromotive Div. and Motorola Co.

Empire Dist. Elect. Co. officials—Claude Hill, Aurora, Mo. district manager, and J. T. Jones, vice-president and gen. mgr.—flank Thos. Epps, mayor of Branson, Mo., where the E.D.E. Co.'s first Total Electric Home Economics workshop was held recently.

Chairman of the E.D.E. Co. workshop was Edna Fyrne Moore, home service director for the utility. Given responsibility for the Total Electric Workshop program late in 1959, she guided the successful presentation following nearly a year of intensive planning.

"All-Electric" Workshop First for Empire Dist.

From the 125 communities served by the Empire District Electric Company 80 home ec teachers and home demonstration agents met recently in the first Total Electric Home Economics Workshop of its kind held in the E.D.E. Co.'s service area. The five major electric appliance manufacturers (Norge Corporation, Thomas Industries, Philco Corporation, General Electric Company, and Sunbeam Corporation) cooperating in the presentation of this two-day workshop indicated this was one of the most productive and rewarding in which they had participated.

From the long discussion periods initiated by the educators and their lively participation in them, it was evident that the Total Electric Workshop filled a definite need for information on electrical appliances and equipment, the utility reports. In addition, the voluntary and enthusiastic endorsement of the workshop by the State Boards of Education and State University Departments of the States of Missouri, Kansas, and Oklahoma further underlined the value of such a program to the educators. The E.D.E. Co. and the manufacturers involved expressed a desire to make this event an annual undertaking.

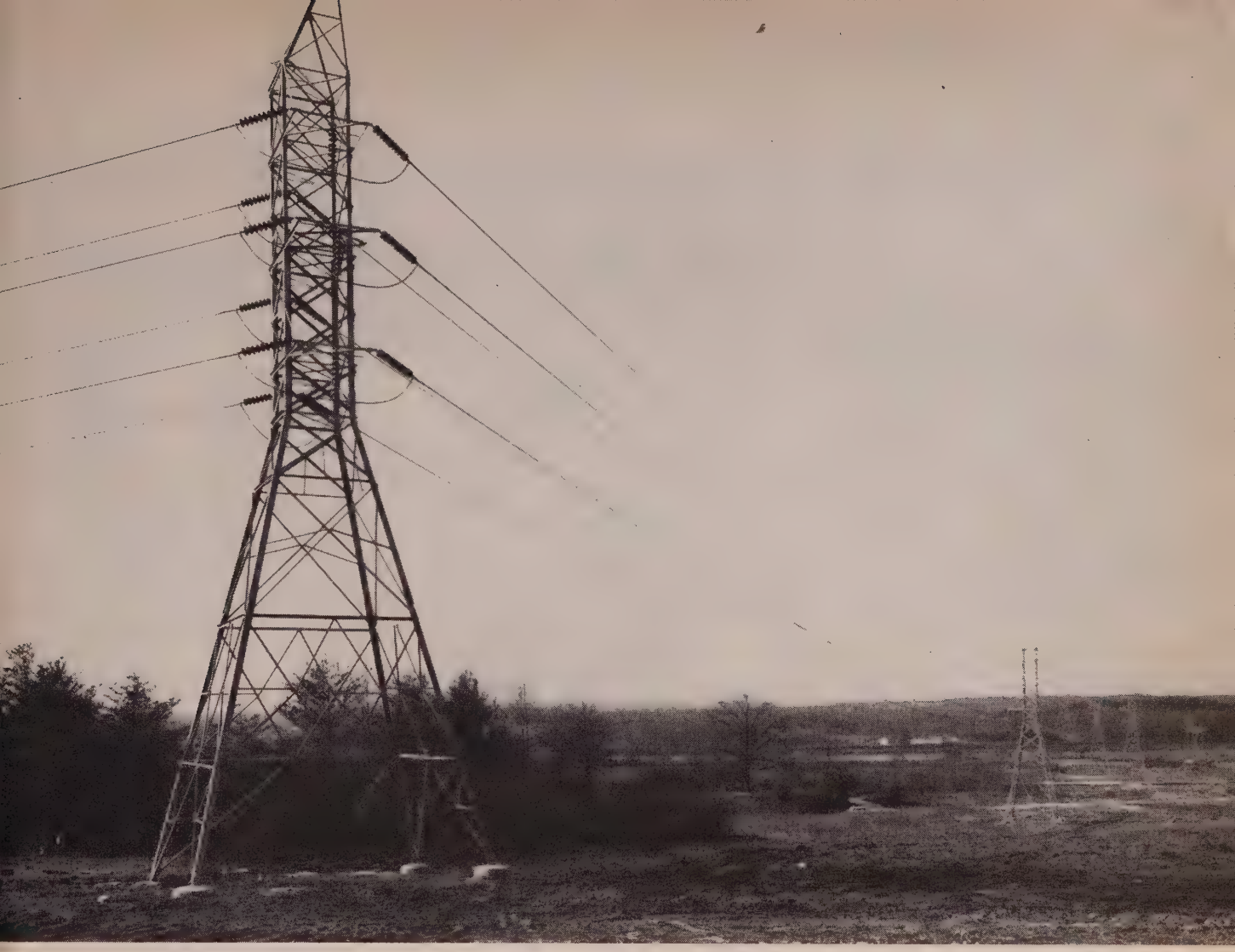
The original idea for the workshop came from the educators themselves and was heartily endorsed by the State Education Departments involved. As a result of the contacts of the E.D.E. Co. with the public school systems in its area, particularly in connection with the annual Home Economics Demonstration Contests held for the past seven years, the Home Service section of E.D.E. Co. assumed a natural function as nucleous for the planning and development of this workshop.

"NEAR" *—Cont. from page 28*

is an imminent possibility."

Electric utility organizations represented at the NEAR demonstration included: American Electric Power Company, City of Los Angeles Department of Water and Power, Commonwealth Associates, Inc., Consumers Power Company, Cleveland Electric Illuminating Company, Tennessee Valley Authority, Central Vermont Public Service Corporation, American Public Power Association, Wisconsin Public Service Corporation, Northern Indiana Public Service Co., Hydro-Electric Power Commission of Ontario, Baltimore Gas and Electric Company, Metropolitan Edison Company, Duquesne Light Company, The Detroit Edison Company, Bonneville Power Administration, Iowa-Illinois Gas and Electric Company, Southern Services, Inc., Rochester Gas and Electric Corporation, Central Hudson Gas and Electric Corporation, Texas Electric Service Company, Arkansas Power and Light Company, Portland General Electric Company, Texas Power and Light Company, Southern California Edison Company, Cincinnati Gas and Electric Company, Iowa Electric Light and Power Company, Northern States Power Company, Public Service Company of Indiana, Inc., Wisconsin Electric Power Company, Central Illinois Electric and Gas Company, Kansas City Power and Light Company, Georgia Power Company, Edison Electric Institute, Upper Peninsula Power Company, Central Illinois Public Service Company, Dallas Power and Light Company, Georgia Power Company, Toledo Edison Company, Monogahela Power Company, New England Electric System, Philadelphia Electric Company.

"Applied Citizenship Activity" at the Detroit Edison Co., was reported to a recent AMA Briefing Session on the corporate role and policy in political activity by the utility's vice-president for employee relations, Sylvester Leahy. He said: "We know from voluntary comments that many of the first thousand employes to participate in our citizenship discussion groups are active at the grass roots level. In addition, a number of employees are running for elective or appointive offices." Detroit Edison's estimate: up to 75-percent of this "first 1000" active in some way in politics at the state or local level.



86 tons of dead weight saved on light transmission towers

Since American Bridge first introduced the use of high strength steels in transmission towers, savings have been effected on scores of new transmission lines in all parts of the country. ☐ This new 110 KV double circuit line for Baltimore Gas and Electric is a typical example. By using both USS MAN-TEN and A-7 Carbon Steel to their best advantage, just over a ton of dead weight was trimmed from each of 86 towers, resulting in both material and handling savings. ☐ American Bridge, the world's leading transmission tower specialist, has recently designed towers to carry the highest voltages likely to be used for the next decade. ☐ For recommendations based on your requirements, write American Bridge Division, United States Steel, 525 William Penn Place, Pittsburgh 30, Pennsylvania.

USS and MAN-TEN are registered trademarks

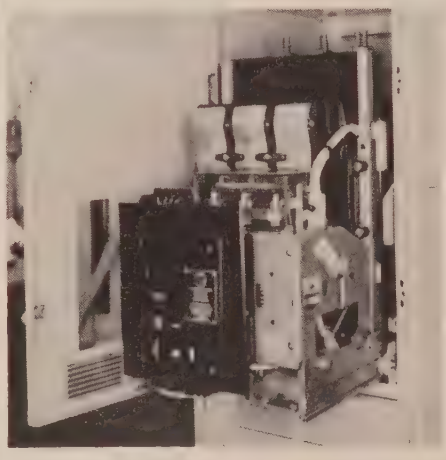
General Offices: 525 William Penn Place, Pittsburgh, Pa.
Contracting Offices in: Ambridge • Atlanta • Baltimore • Birmingham • Boston • Chicago • Cincinnati
Cleveland • Dallas • Denver • Detroit • Elmira • Gary • Harrisburg, Pa. • Houston • Los Angeles
Memphis • Minneapolis • New York • Orange, Texas • Philadelphia • Pittsburgh • Portland, Ore.
Roanoke • St. Louis • San Francisco • Trenton • United States Steel Export Company, New York

American Bridge Division of United States Steel

USS

NEW PRODUCT DESIGN

High Capacity Fault Protection



The I-T-E K-Don L-V circuit breaker combines current-limiting fuses with features of the company's K-Line stored-energy breaker in a single switchgear compartment. The merger of the two gives high-speed protection against high-capacity faults up to 200,000 amps, and affords protection without sacrificing adjusting flexibility needed for overcurrent and medium-capacity short-circuit trips. The trigger-fuse device shown on the right, above the escutcheon, prevents single phasing. The current-limiting fuses provide fault protection to the system, breaker, load-slide equipment, and operating personnel. Easy to mount, the current-limiting fuses will not blow below the preselected point. They are so situated that they are inaccessible until the breaker is withdrawn from the compartment. By **I-T-E Circuit Breaker Co.**

Circle item #25 on reply card

Fog Type Insulator

A special purpose fog type suspension insulator, designed for use in areas of heavy contamination where natural cleaning is inadequate, has been developed by **Lapp Insulator Co., Inc.** Units are rated at 15,000 lbs, M and E strength and are available for ball socket or cleavis-eye mounting. Triple petticoat design provides 18 in. of leakage distance, same as Lapp standard fog insulators.

Circle item #26 on reply card

Disconnect Switch

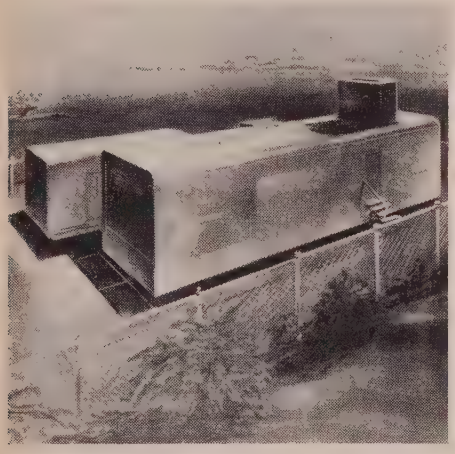
Type B-2L outdoor hookstick disconnect switches by **H. K. Porter Co., Inc.**, feature a 10 degree blade angle in closed positon, fewer current interchanges, new hook ring shape to self-seat the hookstick prong at a point of greatest mechanical advantage. Also has integral pryout device and combination lateral blade latching and positive operation under ice or corrosion conditions.

Circle item #27 on reply card

Gas Turbine Peaking Units

Econo-Pac plants, self-contained, automatically controlled gas-turbine power plants in ratings of 3,000, 7,000, and 12,000 kw have been announced by **Westinghouse Electric Co.** Designed for peaking, reserve capacity, or emergency operation, the units can be installed for as little as $80 per kw, based on winter operation. Design makes possible operation within two weeks after delivery.

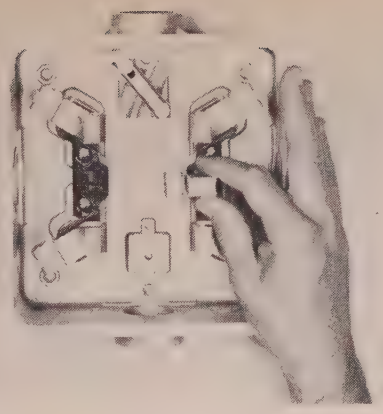
Circle item #28 on reply card



Transmission System

An economical transmission system consisting of one to three phase conductors, messenger, and Spanway spacers, capable of carrying conductors up to 400 Mcm and voltages up to and including 15 kv has been introduced by **Anaconda Wire and Cable Co.** Spacers hold the phase conductor in a six-in. configuration. Spacer features low leakage and high corona levels when exposed to wet atmospheric conditions.

Circle item #29 on reply card



Aluminum Square Socket

Die-cast aluminum meter sockets with a unique jaw and connector assembly adaptable to either aluminum or copper wire has been announced by **General Electric.** S-2 outdoor socket combines J-shaped wire connector and terminal jaws that provide a continuous current path from the meter terminal blade to the conductor. Minimized heat rise boosts both meter performance and socket reliability.

Circle item #30 on reply card

23% Lighter
25% Smaller

NEW GENERAL ELECTRIC 500-KVA DISTRIBUTION TRANSFORMERS OFFER GREATER CAPACITY IN LESS SPACE

Now you can mount three 500-kva distribution transformers in the same space formerly required for three 333-kva units. This 500/560-kva unit is only 61 inches tall, and its total weight has been reduced to 3000 pounds. Similar weight and size reductions apply to other 500-kva ratings as well as 250- and 333-kva sizes.

Operating characteristics have been improved too. Total losses have been lowered as much as 13 percent. And, you get the extra 12 percent kva capacity of General Electric's Permalex* transformers, increasing the installed kva capacity of a 500-kva unit to 560 kva, or the capacity of a bank of three 500-kva units to 1680 kva.

Find out about the significant savings that are yours when you use General Electric large distribution transformers. For details, see your General Electric Sales Engineer or write to Section 483-05, General Electric Co., Schenectady 5, New York.

** Reg. Trademark of General Electric Co.*

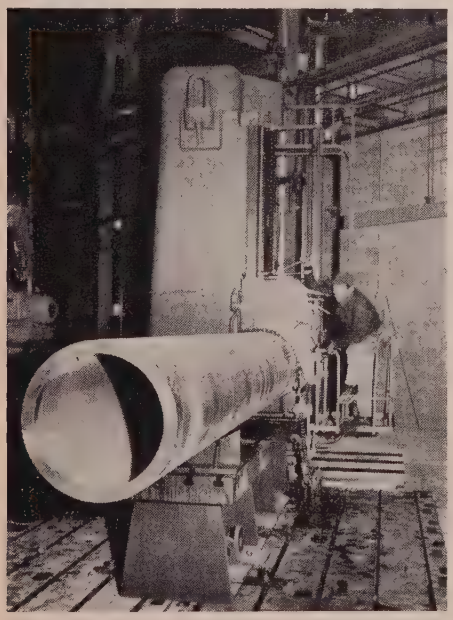
Progress Is Our Most Important Product

GENERAL ELECTRIC

Begin Operation of Kellogg Power Piping Plant

High-temperature, high-pressure piping systems are now in production at the new $4-million Power Piping division plant of the M. W. Kellogg Co. Located in Williamsport, Pa., the new facilities also include completely-equipped metallurgical and welding laboratories and the headquarters for the division.

Piping in this boring mill of M. W. Kellogg Co. power piping division's new plant is a stainless steel section to be shipped to the Indian Point nuclear power station of Consolidated Edison.



An in-line production system is used throughout. Rough, raw materials start at one end of the plant and move to the other in a straight-line operation, reducing materials-handling time and eliminating waste motion. Manufacturing stations along the one-direction work flow include cutting, bending, machining, welding, heat treating, radiographic inspection, and shipping.

Equipment in the metallurgical laboratory will enable Kellogg to perform mechanical and physical tests such as tensile, impact and hardness tests, at all ranges and temperatures. Other equipment will be available for making microscopic studies, supplemented by metallographic equipment for making records.

Much of the effort in the welding lab will be devoted to development of automatic procedures for pipe welding carried out as part of the company's search for more efficient means of manufacturing more economical power piping.

Engineering, procurement, estimating, field erection services, administration, and management functions will be housed in the new office building. Sales offices for the division will remain in New York.

PRODUCTION BRIEFS

Leach Corporation has purchased the U. S. Relay Co. from Phillip Morris to better provide for the relay requirements of its customers. Evaluation of the U. S. Relay line is under way to determine which will be continued under the Leach label.

A "computer division" has been organized as a new operating unit of **Information Systems, Inc.** The new division consolidates the computer operations of ISI and broadens the total product line of ISI's western operation. A second operating unit of ISI, the Panellit division, located in Skokie, Illinois, will continue to provide field engineering, maintenance, and construction serv-

(Continued on next page)

Production Briefs (Cont'd)

ices for the new division, in addition to manufacturing alarm and annunciator systems and control panels.

General Electric's computer department moved further toward full-line development of computer peripheral equipment with the establishment of the Peripheral Equipment Engineering group. The new group will be responsible for developing all computer accessory equipment comprising integrated data-processing systems. This will include magnetic character-readers, sorters, encoders, printers, and secondary generation devices such as optical character recognition and thermoplastic tape systems. Kenzel P. Manning has been named manager.

Kuljian Corp. has opened a new consulting office in San Francisco. Albert F. Kerss has been appointed manager of the new office.

The Electric Autolite Co. is expanding its industrial instrument business by the acquisition of the **Marshalltown Manufacturing Co.**, Marshalltown, Ia., manufacturers of Bourdon tube type and diaphragm actuated pressure gauges, industrial thermometers and hydrometers.

Products developed and manufactured by the **Beckman Instruments, Inc.** San Gabriel, Calif., plant (formerly Harold Kruger Instruments) have been transferred to the Fullerton, Calif., plant of the Scientific and Process Instruments division of Beckman.

Robertshaw-Fulton Controls Company's eastern research center has been opened at King of Prussia, Pa.

A new research laboratory to serve the electrical industry will be built in Fort Wayne, Ind., for **Rea Magnet Wire Co.**, subsidiary of Alcoa. The facility will be constructed on a site about two and one-half miles from the company's Fort Wayne works and main office. Completion is scheduled for next year.

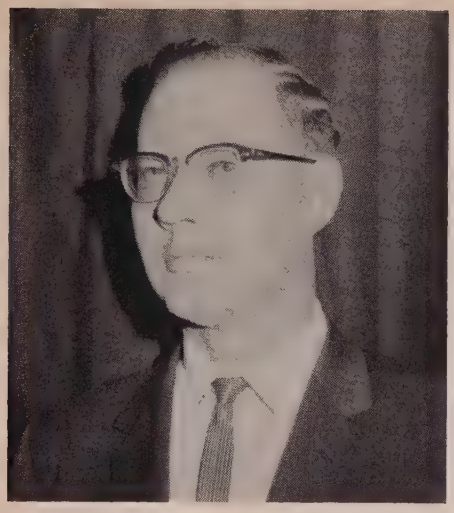
SALES BRIEFS

Sangamo Electric Co. has announced the formation of a new Electronic Products sales group to handle marketing of the company's capacitors, inductive components, sonar, tape transports, and other electronic equipment. **Robert R. Wylie,** previously Sangamo marketing manager, has been appointed manager, electronic products sales. **Glen DeKraker,** former assistant marketing manager, has been made manager, marketing service, and will also assist Mr. Wylie as sales manager, electronic systems.

Electronic data processing on a round-the-clock basis is now available to commercial customers at the fourth **RCA EDP Center** in Chicago. The center is equipped with the RCA 501 all-transistorized system.

Fisher-Pierce Co. has announced the appointment of H. C. Langmack Co., Washington, D. C., as sales representatives for the District of Columbia, Virginia, and Maryland, except for the eastern shore.

Enabnit Joins EL&P



Elgin G. Enabnit, Jr., has joined the staff of Electric Light and Power magazine as associate technical editor.

Prior to joining EL&P, he was a rate and evaluation engineer with Middle West Service Co. Previous to this he was with the electrical section of the Federal Power Commission in the Chicago regional office.

Mr. Enabnit earlier spent six years in transmission and distribution system construction, first with the Bureau of Reclamation in North and South Dakota and later with the Interstate Power Co.

Nunlist Worthington VP

Frank J. Nunlist has been appointed to the new position of Vice

(Continued on page 92)

MEN OF POWER

Westinghouse Elects Ross VP

Philip N. Ross, one of the pioneers in the development of atomic reactors for power uses, has been elected a vice president of the Westinghouse Electric Corporation, President Mark W. Cresap, Jr., announced recently.

Mr. Ross is general manager of the Bettis atomic power laboratory which Westinghouse operates for the U. S. Atomic Energy Commission. He has been with the laboratory since it was first established here in 1948 and has seen it grow in the next decade to become one of the world's leading reactor development centers with a notable record of achievements in the development of atomic power for military and civilian purposes.

A 21-year veteran with Westinghouse, Mr. Ross was named general manager of the Bettis laboratory, July, 1959.

Mr. Ross holds the Westinghouse Order of Merit—the highest honor the company confers on employes. He received the award in 1953 "for his broad understanding and clear expression of nuclear power problems; for his contributions toward the development of the research department of the Atomic Power Division; and for his successful guidance in the completion of the nuclear core and its control drive mechanisms for the first submarine atomic power plant."

Watson To New Post

Philadelphia Electric Co. has announced that Charles W. Watson has been elected vice president-general administration. He is the former assistant to President R. G. Rincliffe.

Mr. Watson is a 29-year veteran with the utility. His earlier assignments were in the electric generating department, including the positions of engineer of station operating, assistant administrative engineer, and superintendent of the station economy division. He was named assistant to the president in 1957.

He is a registered professional engineer and a member of numerous professional and industry organizations.

Government Finds Air Grows Dirtier Despite New Preventive Push

* * *

Los Angeles Leads in One Type Of Dirt, Phoenix in Another; Local Groups Confer Today

By James A. Reynolds
Staff Reporter of The Wall Street Journal

WASHINGTON—The Government is about to unveil the initial findings of the first systematic attempt to measure the scope and seriousness of a major national problem: Dirty air. A preliminary peek at the findings indicates the problem is indeed serious and involving preven-

The dry desert air is relatively free from the chemical heavy load of nose-clogging dust it's relatively free from the chemical pounds which may cause lung cancer, eye smarting, bronchial ills, and other ailments. Not surprisingly, Federal air samplers found the highest concentration of these air-borne chemicals in Los Angeles, fondly called "The Smog Capital of the World" by some of its residents.

Phoenix and Los Angeles are only two of 167 spots across the country, both urban and rural, where the U.S. Public Health Service is regularly taking air samples. The first Federal findings, based on samples pulled out of the air last year, will be made public here during a Government-sponsored National Conference on Air Pollution that starts today.

The Keys and the Capital

Even the layman can see a startling difference in some of the samples tested by the P.H.S. One filter which will be exhibited this week has only a few specks on its white surface; it was used in sampling the pure ocean air in the Florida Keys. Another filter turned dirty brown during its 24-hour run; it came from the nation's capital, where the air is relatively clean—for a big city. But a third filter is caked with jet black grime; it came from Cleveland.

The sampling network, it's hoped, will provide answers to two questions which have long puzzled public health experts: Where is the air dirtiest now? Where is it getting dirtier? Last year's sampling should answer the first question, while subsequent surveys should answer the second one. Once they know the extent of the air pollution problem, officials add, they can intelligently work out an effective air-cleaning program.

"Pollution of the air is an unwanted by-product of progress, and it tends to grow as our cities and industries grow," warns U.S. Surgeon General LeRoy E. Burney. "It is time for us to take stock of what we know and what is being done about air pollution, and to outline a plan which will enable us to keep pace with the growing dimensions of the problem."

This week's conference is designed to speed up the stock-taking process. Air pollution experts from all over the country will analyze the causes and effects of dirty air, and offer proposals for cleaning it up. Dr. Burney hopes will agree on a 10-year anti-

Lapp introduced the "Fog-Type" insulator design 35 years ago to answer the demand for an effective means of overhead transmission under conditions of severe atmospheric contamination.

All evidence points to the fact that dirt conditions today are worse than ever before, and that there is no real relief in sight.

Realistic appraisal of the problem dictates the wisdom of *handling* dirt conditions, which, for outdoor distribution, transmission and station systems, means *insulating* for it.

. . . . Better insulate for it

Why has Lapp's 35-year concept of Fog-Type design remained the one constant in this much-misunderstood area of insulator behavior? Why have Lapp Fog-Type corrugations become the industry standard design for bushings, potheads and other critical outdoor use?

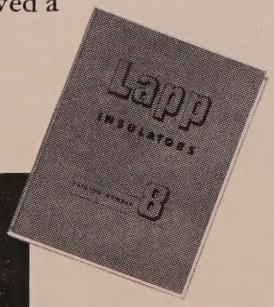
It is because Lapp Fog-Type design is based on the principle of avoiding leakage flashover by controlling leakage current flow. The extra length of leakage path is also a uniform leakage path. Dry, high-resistance, shielded areas of insulator surface are avoided; instead, there's a maximum exposure of surface to contamination . . . to wetting . . . and to cleaning action of wind and rain. Current flows evenly, voltage is distributed over the surface, leakage flashover is prevented.

Even in most areas of severe atmospheric contamination, Lapp Fog-Type insulators require no cleaning; where they do, cleaning intervals are longer, and cleaning is easier than on other types.

Forward utility thinking now calls for use of Fog-Type insulation on *all* systems in sea-shore or urban locations. It pays off in improved service and reduced maintenance costs.

"Fog-Type design" has been a provocative subject over the years. Lapp's viewpoint is explained, and substantiated, in the new Lapp Catalog No. 8. If you have not received a copy, ask for it.

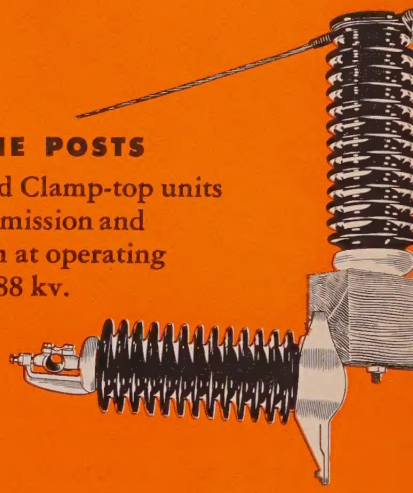
Lapp Insulator Co., Inc.,
LeRoy, New York.



Lapp

LAPP DISTRIBUTION FOG-TYPE INSULATORS

• Fog pin-types for voltages to 20 kv; Distribution Posts in three sizes for use up to 27 kv; Fog-Type distribution dead end insulators; Distribution switch Posts in four sizes to 150 BIL.

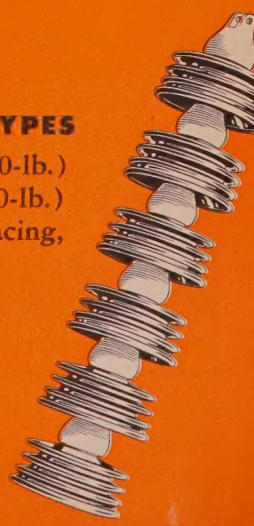


LAPP LINE POSTS

Tie-wire and Clamp-top units for subtransmission and transmission at operating voltages to 88 kv.

LAPP STATION POSTS

Superior electrical and mechanical characteristics for all switch and bus support at voltage ratings to 1,800 BIL.



SUSPENSION FOG-TYPES

Standard strength (15,000-lb.) and high-strength (25,000-lb.) units for 5¾" or 6½" spacing, either ball-socket or clevis type.

Duke Power Elects V.P.

Elected vice president of Duke Power Co. recently was G. G. Mattison, formerly manager of production and transmission.

A 36-year veteran of the company, Mr. Mattison originally started with the company in the electrical construction department. He served successively as switchboard and control crew foreman, field crew supervisor, maintenance engineer, and assistant superintendent of electrical construction and maintenance before being named manager of production and transmission.

G. G. Mattison

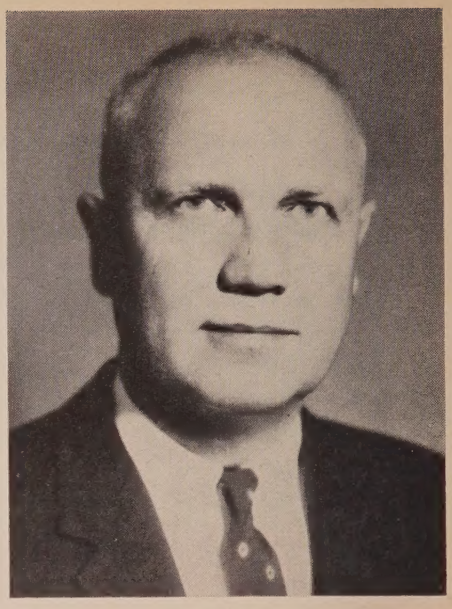
B&W Elects VP

Alden P. Taber has been elected a vice president of The Babcock & Wilcox Company and placed in charge of the Research and Development division, it was announced by M. Nielsen, president.

Since joining the company in June of 1959, Mr. Taber has been a member of the president's staff, coordinating and directing research and development activities.

In his new position, Mr. Taber will have cognizance over the total research and development effort of the company. He will also be responsible for coordinating this work among all B&W divisions and subsidiaries, and for developing plans for R&D projects for the company as a whole.

Mr. Taber will make his headquarters at the B&W Research Center in Alliance, O., and will also maintain an office at the company's New York headquarters. Continuing as director of research at the Research Center is Paul R. Grossman, who will report to Mr. Taber.



A. P. Taber

At the same time, the board of directors named three assistant vice presidents: Channing B. Brown, formerly manager of the industrial power department; Charles B. Miller, Jr., former manager of distribution engineering and operation; and Herman B. Wolf, formerly manager of operations.

PEA Elects Officers

New officers of the Pennsylvania Electric Association, elected for the year 1960-61 are: (l. to r.) Franklin H. Lichtenwalter, Vice President and Managing Director; Philip M. Alden, Vice President, Philadelphia Electric Company, and Vice President, P. E. A.; G. R. Parry, Vice President, Metropolitan Edison Company, and President, P. E. A.; Charles S. Bowden, Vice President, Pennsylvania Power Company, New Castle, and Vice President, P. E. A. Also elected but not shown in the photograph was Park R. Lawson, Pennsylvania Electric Company, Johnstown, Vice President, P. E. A.

Nunlist (Cont'd)

President—Operations of Worthington Corporation.

In his new position Mr. Nunlist, formerly a Group Vice President of Worthington, will be responsible for the activities of all the Company's sixteen domestic operating divisions in ten states and regional engineering and service activities. He will report to Walther H. Feldmann, President.

MEN OF POWER BRIEFS

UTILITIES

Dean William Caple, former supervisor of the corporate department, Rochester Gas and Electric Corp., has been elected assistant secretary for the company. He has been with RG&E since 1948.

S. F. Diffenderfer has been named manager of Pennsylvania Power & Light Co.'s business development department. He succeeds **H. H. Brenan,** who retired several months

(Continued on next page)

ago. Mr. Diffenderfer was formerly assistant to the vice president, commercial.

The appointment of **Dean C. Yahn** to the post of district electrical superintendent at Watrous, has been announced by the Saskatchewan Power Corp.

Philadelphia Electric Co. has announced a number of appointments in its engineering and research department: **Robert F. Gilkeson** has been named manager of the department, having been superintendent of the Eddystone Station. Other appointments include: **A. H. Kidder,** who was named assistant to the vice president: **J. L. Everett III,** named director of research; **C. W. Bary,** director of economic and rate analysis; and **J. A. Thielman,** assistant director, economic and rate analysis.

Also, **T. S. Fetter, Jr.,** former executive engineer, was promoted to assistant to the president of the company.

J. B. Cooke, supervising civil engineer of Pacific Gas and Electric Co. was recently presented the Rickey Medal by the American Society of Civil Engineers at its annual convention in Boston. The gold medal is awarded annually to a member of the society who has contributed importantly to the progress of hydro-electric engineering and was presented to Mr. Cooke for his paper on the PG&E Kings River Project and his advancement of the technology of rockfill dams.

Arkansas Power and Light Co. has announced the promotion of **Edward G. Barry** from commercial sales manager to general sales manager.

Walter C. Gumbel, Monongahela Power, has been elected president of the Soil Conservation Society of America.

Saxon B. Palmeter has been named superintendent-construction for Jersey Central Power & Light and New Jersey Power & Light.

Chattanooga Electric Power Board has named **Roy McKenzie** Sr., chairman, succeeding the late L. J. Wilhoite.

MANUFACTURERS

Wesley J. Gorder has assumed the post of manager of sales and engineering, Alrectic division, McGraw-Edison Co.

Jacob H. Ruiter, Jr., has been promoted to manager of sales promotions for Weston Instruments division, Daystrom, Inc.

R. Wayne McLaughlin has been appointed to the post of general manager of the Ridgway, Pa., operation of the Elliott Co.

Delta-Star Electric division's new director of marketing is **George S. Arneson.** Also, promoted at Delta Star are **Walter E. Taylor, Jr.,** manager of engineering, **William F. Hiel,** manager of manufacturing, and **Jon N. Reynolds,** manager of customer service.

Announcement of the appointment of **Neil K. Barr** as technical manager of the electrical conductor division has been made by Kaiser Aluminum and Chemical Sales, Inc.

Paranite Wire and Cable products sales manager is **J. W. Mitchell,** a 10-year veteran of company.

Lewis S. Armstrong has been named northeast region manager of the A. B. Chance Co. He succeeds E. J. Higgins, who has resigned.

Appointment of **Charles F. Ebsen** as general manager of Foster Wheeler Corp. has been announced by John E. Kenney, president.

Arthur Kaufmann, vice president and treasurer of Kuhlman Electric, has added the responsibilities of assistant general manager.

Cerro de pasco Corp. has appointed **Robert G. Axtell** director of marketing.

Electro-Motive division of General Motors has announced a series of top management changes following the transfer of **R. H. Bish,** works manager, to a new assignment in the GM Technical Center, Detroit. **George D. Baker** has been named manufacturing manager in charge of all manufacturing operations; **John H. Anderson** named manager of manufacturing facilities; **Robert A. Stoddart,** manager, production control; **W. N. Fritts,** named manager, branch operations; and **H. D. Dana,** promoted to manager, quality control.

S & C Electric Co. has announced the promotion of **Jack B. Castle** to the post of manager of the sales service division. At the same time, **Philip J. McLaughlin** has been named manager of the east central sales division.

Federal Pacific Electric Co. has elevated **John N. Hutson** to north central regional manager.

Westinghouse Electric Corp. has announced the following promotions: **Charles E. Hammond,** Central Pacific district manager of apparatus marketing; **Robert L. Wells,** director of the company's newly created management and professional personnel services department; **Bruce W. Morrison,** area sales manager, Boston district office.

Two top-management assignments have been made at Osmose Wood Preserving Co. of America. **William D. Kieber,** former field superintendent of the Utilities division, has been named manager of the division. **Scott Hockenbery** has moved up from field superintendent to manager of Pole Sprayers, Inc., a subsidiary specializing in above-ground treatment of in-place poles.

Appointment of **R. C. Brown** as manager of sales has been announced by Allis-Chalmers control department. He succeeds **G. G. Brooks,** who has been transferred to the company's associate firm, Consolidated Systems Corp.

Also, **Dale F. Eyster** has been promoted to the position of project manager, nuclear products, at Allis-Chalmers.

Victor G. Kocenko becomes director of manufacturing of Daystrom, Inc., Weston Instruments Division—Newark, according to a recent appointment. He was formerly superintendent, parts manufacturing.

CALENDAR OF EVENTS

December 5—Edison Electric Institute, Market Research Committee, New York, N. Y.

December 5-7—Edison Electric Institute, Commercial Lighting Committee, Philadelphia, Pa.

December 5-8—Third National Conference on the Application of Electrical Insulation, Conrad-Hilton Hotel, Chicago, Ill.

December 8-9 — Edison Electric Institute, Street and Highway Lighting Committee, Cincinnati, Ohio.

December 13-15—Institute of Radio Engineers, 1960 Eastern Joint Computer Conference, Hotel New Yorker and Manhattan Center, New York, N. Y.

December 13—Electric Companies Public Information Program, Steering Committee Meeting, Edgewater Beach Hotel, Chicago, Ill.

December 13-14—National Safety Council, Public Utilities Section, Executive Committee Meeting, Statler Hilton Hotel, New York, N. Y.

December 15-16 — Edison Electric Institute, Residential Electric Heating and Air Conditioning Committee Meeting, Cincinnati, Ohio.

January 19-20, 1961—Edison Electric Institute, Transmission and Distribution Committee, Baltimore, Md.

January 23-27, 1961 — Doble Engineering Conference, Boston, Mass.

January 25-26, 1961—Southeastern Electric Exchange, Legal and Claims Committee Meeting, Miami Beach, Fla.

January 26-27, 1961—Pennsylvania Electric Association, Engineering Section, Communications Committee Meeting.

January 29-February 3, 1961—American Institute of Electrical Engineers, Winters General Meeting, Statler Hotel, New York, N. Y.

February 5-7, 1961—National Association of Purchasing Agents, Public Utility Buyers Group, Detroit, Mich.

February 13-16, 1961—American Society of Heating, Refrigerating, and Air-Conditioning Engineers, Annual Meeting and 15th International Heating and Air-Conditioning Exposition, International Amphitheatre, Chicago, Ill.

February 16-17, 1961—Pennsylvania Electric Association, Engineering Section, Electrical Equipment Committee, Pick-Roosevelt Hotel, Pittsburgh, Pa.

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